

Health Information Technology in the United States:

Driving Toward Delivery System Change,
2012



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Introduction

Health information technology (HIT) has become central to health care reform policy-making due to its potential to improve efficiency and increase the quality of health care in the United States. Adoption of these technologies has remained a priority of the federal government as evidenced by incentive programs enacted through legislation, including the American Recovery and Reinvestment Act of 2009 and the Patient Protection and Affordable Care Act. Since our inaugural report in 2006, we have found slow steady increases in the level of adoption for physicians and hospitals throughout the United States. Now, as these incentive programs and other reform initiatives begin implementation, we continue to track the progress of the nation's health care system toward universal adoption of electronic health records (EHRs). Mirroring the emphasis at the federal level on the use of this technology in a way that has the greatest potential to improve the overall quality and efficiency of care, this report expands on our previous analysis by investigating health care providers' readiness to meet program requirements and explores the role of HIT in other health care reform initiatives.

Major Content Areas

Chapter 1: Progress on Adoption of Electronic Health Records

The first chapter analyzes 2011 electronic health record adoption data from surveys of U.S. hospitals and office-based physicians, and changes in EHR adoption from 2002 through 2011. This chapter assesses the intention to apply for meaningful use (MU) incentives among physicians and hospitals and assesses progress towards meeting meaningful use requirements.

Chapter 2: Health Information Exchange Under HITECH: Early Findings

In the chapter on health information exchange, we review the most recent data on the progress and challenges of HIE at the local level. We also examine state-level approaches to increasing the use of health information exchanges under the Cooperative Agreement Program. Finally, we discuss policy implications and potential future policy-making activities at the federal level to ensure the electronic exchange of health information across the health care system.

**Chapter 3: “The Next Steps Are Always Easier Once You’ve Started”:
An Interview by Michael Painter With David Blumenthal**

In his interview with Dr. Michael Painter, Dr. David Blumenthal reflects on his time as national coordinator in the Office of the National Coordinator. He highlights the numerous roles of health information technology and health information exchanges, in addition to the challenges of implementing them. Furthermore, Dr. Blumenthal provides insight into the effectiveness of HITECH and the importance of continuing to track adoption and registration for meaningful use.

Chapter 4: Enabling Meaningful Delivery System Reform Through Health Information Technology and Promising New Health Care Models

In this chapter, we discuss the importance of HIT in successful health reform models, including the patient-centered medical home and the accountable care organization. This chapter examines the supports and barriers to HIT development in addition to the effect of policy on the state of HIT development.

Chapter 1: Progress on Adoption of Electronic Health Records[†]

Catherine M. DesRoches, DrPH and Samantha Stalley, MHA, Mathematica Policy Research

In our first report, *Health Information Technology in the United States: The Information Base for Progress*, we noted a dearth of methodologically rigorous data on the adoption of electronic health records (EHRs) in both physician offices and hospital settings. Many changes have occurred since that time. The federal government has invested significant dollars to incentivize physicians and hospitals to adopt EHRs and has set criteria that encourage not only the adoption but also the meaningful use (MU) of this technology. In addition, there are now two ongoing, high-quality data collection efforts which allow us to examine changes in EHR adoption among physicians and hospitals over time. One is the National Ambulatory Medical Care Survey (NAMCS): Electronic Medical Records Supplement, conducted by the National Center for Health Statistics (NCHS); the other is the American Hospital Association (AHA) Health Information Technology Supplement. Both of these survey efforts are funded by the Office of the National Coordinator for Health Information Technology (ONC). In the following chapter, we review recent findings from these surveys and examine progress toward the goal of universal adoption.

National Ambulatory Medical Care Survey: Electronic Medical Records Supplement

NAMCS is a nationally representative survey of office-based practicing physicians (excluding pathologists, radiologists, and anesthesiologists) conducted annually by NCHS. Since 2008, NCHS has also conducted a nationally representative supplemental mail survey of physicians focused on the adoption and use of health information technology. In 2011, the survey was sent to 10,301 physicians; the survey had an unweighted response rate of 64 percent. The 2011 survey includes items assessing the adoption of specific health information technology (HIT) functionalities (e.g., electronic order entry, electronic results viewing), type of EHR, electronic data exchange, and intention to apply for meaningful use incentives.

Trends in Adoption

A recent NCHS Data Brief using the 2011 data examined trends in physician adoption of EHRs over the last decade. As shown in Exhibit 1, the proportion of physicians reporting the use of any EHR (defined here as either “all electronic” or “part paper/part electronic”) increased from 17.0 percent in 2002 to 57.0 percent in 2011, while the proportion of physicians with at least a “basic” system² rose from 12.0 percent in 2007—the first year NAMCS included these measures—to 34.0 percent in 2011.^{2–3} Further analysis by Decker, et al., provides additional data on how rates

[†] The content of this chapter has been excerpted from the following *Health Affairs* articles: Decker S, Jamoom E, Sisk J. Who’s behind the curve? A decade of physician adoption of electronic health records, 2002–2011. *Health Aff* (Millwood). 2012;31(5). [Epub ahead of print], archived and available at www.healthaffairs.org.

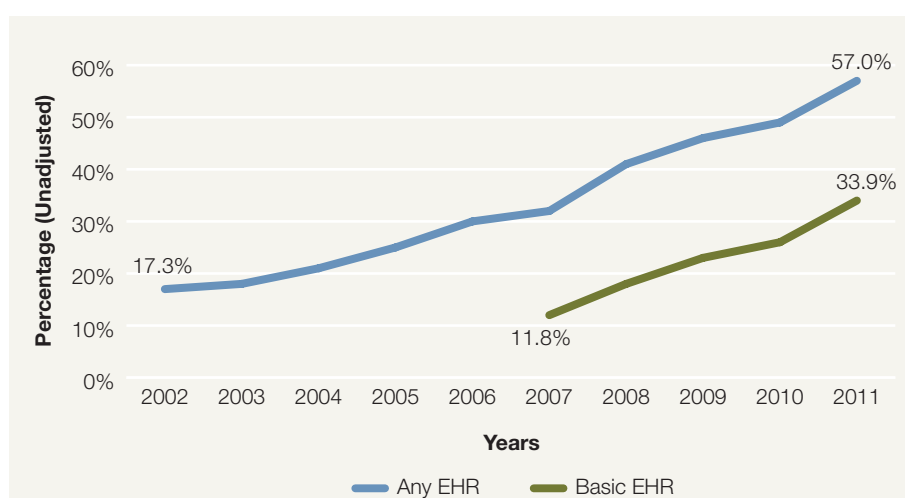
Hsiao C, Decker S, Hing E, & Sisk J. How ready are physicians for meaningful use? *Health Aff* (Millwood). 2012;31(5). [Epub ahead of print], archived and available at www.healthaffairs.org.

DesRoches CM, Joshi M, Worzala C, Kralovec P, Jha AK. Small, non-teaching, and rural hospitals continue to be slow in adopting electronic health record systems. *Health Aff* (Millwood). 2012;31(5). [Epub ahead of print], archived and available at www.healthaffairs.org.

of adoption varied among physicians over the decade.⁴ As shown in Exhibit 2, the rate of adoption of at least a basic EHR system, adjusted for physician and practice characteristics, increased more quickly among primary care physicians (17.1% to 40.2%) as compared to specialists (12.4% to 30.9%). Likewise, younger physicians, those in practices with more than two physicians, and those in the Northeast region of the United States, all adopted at a faster rate than their counterparts.⁴

Starting in 2010, the NAMCS sample was expanded to permit reliable state-level estimates of EHR adoption. As shown in Exhibit 3, there was wide variation in rates of adoption of a basic EHR across the states. Minnesota (60.9%), Wisconsin (59.9%) and North Dakota (57.9%) had the highest rates of EHR adoption while Louisiana (15.9%), New Jersey (16.3%), and South Carolina (19.5%) had the lowest.³

Exhibit 1: Percentage of Office-Based Physicians With EMR/EHR Systems: United States 2002–2011



Source: Hsiao CJ, Hing E, Socey TC and Cai B. *Electronic Health Record Systems and Intent to Apply for Meaningful Use Incentives Among Office-Based Physician Practices, 2001–2011*. NCHS Data Brief, no. 79. Hyattsville, MD: National Center for Health Statistics, 2011.

Notes: Any EHR consisted of responses to: “Does this practice use electronic medical records or electronic health records?” A basic EHR through 2009 included six (recording patient demographic information; clinical notes; and patient problem lists; viewing laboratory results; viewing imaging results; and using computerized prescription ordering) of the seven features that were mentioned in the first RWJF report on EHRs (*Health Information Technology in the United States: Where We Stand, 2008*). Basic EHRs in 2010 and 2011 included additional features: “medication list” in 2010, and “allergies list” in 2011.

The American Recovery and Reinvestment Act of 2009 (ARRA) directed the adoption and meaningful use (MU) of HIT as a national legislative priority. This act authorized the Centers for Medicare & Medicaid Services (CMS) to define meaningful use and provide financial incentives to providers.⁵ To be eligible for these incentives, physicians and hospitals must show that they are using an EHR to 1) electronically capture health information in a coded format; 2) track key clinical conditions and communicate that information for care coordination purposes; 3) facilitate disease and medication management; and 4) report clinical quality measures and public health information. In order to demonstrate that they are achieving these goals and are eligible for payment incentives, physicians and hospitals must meet a set of meaningful use criteria (14 core criteria and five “menu” criteria for hospitals and 15 core and five menu criteria for physicians).

As reported by Hsiao, et al., the 2011 survey found 51.3 percent of all physicians reporting that they intended to apply for meaningful use incentives.¹ The percentage of physicians intending to apply for incentive payment varied across states with more than 60.0 percent of physicians in Massachusetts, Florida, South Dakota, Nebraska, Delaware, and Iowa intending to apply (data not shown), compared to fewer than 40.0 percent in California, New Mexico, and Hawaii. Intention to apply also varied significantly by physician and practice characteristics. As shown in Exhibit 4, younger physicians were more likely to report the intention to apply as compared to older physicians (57.6% among physicians under 45 years of age vs. 44.0% among physicians 55 and older). Physicians working in physician-owned practices were significantly more likely to report intention to apply, as compared to those working in practices owned by another entity (e.g., HMO, academic medical center, other hospital), as were physicians eligible for Medicare incentives, as compared to physicians ineligible for Medicare.¹

While approximately one-half of all physicians reported an intention to apply for incentive payments, only 10.5 percent reported both intention to apply and had adopted an EHR with 10 functionalities necessary to support meaningful use. As shown in Exhibit 5, 40.7 percent of all physicians reported an intention to apply but did not have the necessary functionalities in place for meaningful use. Physicians in practices with more than 10 physicians were significantly more likely than those in smaller practices to be ready and intending to apply. Physicians who worked in physician-owned practices, were eligible for Medicaid incentives, and practiced in non-primary care specialties were all significantly less likely than their counterparts to be ready for meaningful use.

Exhibit 2: **Characteristics of Physicians Using Any Electronic Health Record System (2002 and 2011) or Basic EHR (2007 and 2011)**

| | Percentage of 2011 Sample | EHR Use (Adjusted Percentage) | | | | Basic EHR (Adjusted Percentage) | | | |
|---|---------------------------|-------------------------------|------|------------|---------------------|---------------------------------|------|------------|---------------------|
| | | 2002 | 2011 | Difference | Relative Difference | 2007 | 2011 | Difference | Relative Difference |
| All Physicians | 100.0 | 18.7 | 54.2 | 35.5* | — | 15.4 | 35.0 | 19.6* | — |
| Specialty | | | | | | | | | |
| Non-Primary Care Specialist† | 51.7 | 18.4 | 50.1 | 31.7* | Reference | 12.4 | 30.9 | 18.5* | Reference |
| Primary Care Specialist† | 48.3 | 19.0 | 59.3 | 40.3* | 8.6* | 17.1 | 40.2 | 23.1* | 4.6 |
| Age | | | | | | | | | |
| Physician 45 Years Old or Younger | 28.1 | 16.9 | 63.1 | 46.2* | Reference | 20.2 | 40.0 | 19.8* | Reference |
| Physician 46 to 55 Years Old | 25.9 | 20.5 | 57.3 | 36.8* | -9.4* | 11.0 | 35.5 | 24.5* | 4.7 |
| Physician Older than 55 Years | 46.0 | 20.2 | 46.0 | 25.8* | -20.4* | 12.0 | 30.8 | 18.8* | -1.0 |
| Practice Size | | | | | | | | | |
| 1 to 2 Physicians in the Practice | 39.6 | 13.6 | 39.5 | 25.9* | Reference | 8.8 | 24.2 | 15.4* | Reference |
| 3 to 9 Physicians in the Practice | 43.7 | 19.0 | 59.7 | 40.7* | 14.8* | 12.2 | 37.1 | 24.9* | 9.5* |
| ≥10 Physicians in the Practice | 16.7 | 26.6 | 81.2 | 54.6* | 28.7* | 37.6 | 60.0 | 22.4* | 7.0 |
| Ownership | | | | | | | | | |
| Physician/Physician Group Ownership | 64.7 | 17.0 | 51.2 | 34.2* | Reference | 11.1 | 32.3 | 21.2* | Reference |
| Other Ownership Arrangement‡ | 35.3 | 20.2 | 63.0 | 42.8* | 8.6* | 24.2 | 43.2 | 19.0* | -2.2 |
| MSA Status | | | | | | | | | |
| Within a Metropolitan Statistical Area | 88.4 | 19.2 | 53.4 | 34.2* | Reference | 15.4 | 34.2 | 18.8* | Reference |
| Outside a Metropolitan Statistical Area | 11.6 | 13.3 | 60.5 | 47.2* | 13.0* | 14.3 | 39.3 | 25.0* | 6.2 |
| Region | | | | | | | | | |
| Northeast Region | 21.4 | 19.9 | 52.1 | 32.2* | Reference | 7.1 | 32.6 | 25.5* | Reference |
| Midwest Region | 20.8 | 19.0 | 55.5 | 36.5* | 4.3 | 15.9 | 36.8 | 20.9* | -4.6 |
| South Region | 36.3 | 16.5 | 50.9 | 34.4* | 2.2 | 14.1 | 30.9 | 16.8* | -8.7* |
| West Region | 21.5 | 19.5 | 60.8 | 41.3* | 9.1 | 19.3 | 41.0 | 21.7* | -3.8 |

† Primary-care specialists are defined as those in general or family practice, internal medicine, pediatrics, or obstetrics-gynecology.

‡ Other ownership arrangements are defined as health maintenance organizations (HMOs), community health centers, medical/academic health centers, other hospitals, other health care organizations, and other.

Source: Decker S, Jamoom E, Sisk J. Who's behind the curve? A decade of physician adoption of electronic health records, 2002–2011. *Health Aff* (Millwood). 2012;31(5). [Epub ahead of print], archived and available at www.healthaffairs.org.

Exhibit 3: Percentages of Office-Based Physicians Using Any EMR/EHR System, Having a Basic System (2011), by State

| Percentage | | | Percentage | | |
|----------------------|-------------------|-------------------|-----------------------|-------------------|-------------------|
| State | Any System | Basic System | State | Any System | Basic System |
| United States | 57.0 | 33.9 | Missouri | 57.0 | 32.9 |
| Alabama | 47.3 | 25.8 | Montana | 62.3 | 38.3 |
| Alaska | 59.2 | 29.5 | Nebraska | 58.5 | 35.6 |
| Arizona | 66.7 | 37.0 | Nevada | 52.5 | 23.0 [†] |
| Arkansas | 51.2 | 24.5 | New Hampshire | 68.1 [§] | 38.1 |
| California | 58.6 | 40.4 | New Jersey | 41.8 [†] | 16.3 [†] |
| Colorado | 65.8 | 36.0 | New Mexico | 54.1 | 27.8 |
| Connecticut | 61.9 | 31.5 | New York | 55.3 | 34.6 |
| Delaware | 59.5 | 36.5 | North Carolina | 58.0 | 31.1 |
| D.C. | 65.3 | 21.2 [†] | North Dakota | 84.0 [§] | 57.9 [§] |
| Florida | 48.5 | 28.4 | Ohio | 58.9 | 31.6 |
| Georgia | 58.3 | 31.1 | Oklahoma | 54.7 | 28.2 |
| Hawaii | 71.0 [§] | 46.8 [§] | Oregon | 75.1 [§] | 54.5 [§] |
| Idaho | 52.6 | 24.5 [†] | Pennsylvania | 50.6 | 27.3 |
| Illinois | 53.7 | 28.2 | Rhode Island | 43.8 [†] | 29.2 |
| Indiana | 57.7 | 34.3 | South Carolina | 53.4 | 19.5 [†] |
| Iowa | 73.1 [§] | 48.6 [§] | South Dakota | 55.4 | 41.2 |
| Kansas | 61.2 | 30.9 | Tennessee | 48.2 | 28.6 |
| Kentucky | 46.0 | 28.5 | Texas | 52.4 | 33.9 |
| Louisiana | 39.5 [†] | 15.9 [†] | Utah | 80.8 [§] | 49.3 [§] |
| Maine | 62.5 | 33.3 | Vermont | 66.8 [§] | 35.7 |
| Maryland | 52.7 | 30.6 | Virginia | 59.5 | 29.1 |
| Massachusetts | 71.2 [§] | 43.6 | Washington | 75.3 [§] | 54.6 [§] |
| Michigan | 51.9 | 29.5 | West Virginia | 52.9 | 28.2 |
| Minnesota | 77.6 [§] | 60.9 [§] | Wisconsin | 75.8 [§] | 59.9 [§] |
| Mississippi | 54.3 | 19.9 [†] | Wyoming | 50.6 | 27.2 |

Source: Hsiao CJ, Hing E, Socey TC, Cai B. *Electronic Health Record Systems and Intent to Apply for Meaningful Use Incentive Among Office-Based Physician Practices, 2001–2011*. NCHS Data Brief, no. 79. Hyattsville, MD: National Center for Health Statistics, 2011.

† Significantly lower than national average ($p < 0.05$).

§ Significantly higher than national average ($p < 0.05$).

NOTE: EMR/EHR is electronic medical record/electronic health record.

American Hospital Association Health Information Technology Supplemental Survey

In our 2009 report *Health Information Technology in the United States: On the Cusp of Change*, we presented data from the 2008 American Hospital Association's (AHA's) inaugural HIT Supplemental Survey, showing 9.1 percent of acute care hospitals in the United States with at least a basic EHR in one or more major clinical units. In the following section, we detail findings from the most recently available AHA data and discuss changes in hospital adoption between 2008 and 2011.

Each year the AHA annual survey of health information technology adoption is sent as a supplement to the AHA's Annual Survey to hospital CEOs, who designate the most appropriate staff member to complete it. The 2011 survey was in the field from October through December 2011. The analysis presented in this chapter includes all responding general medical and surgical hospitals in the United States (n=2,646, approximately 50.0% of all acute care hospitals in the United States, as shown in Exhibit 6). Results were statistically adjusted for potential non-response because of modest but statistically significant differences between responders and all U.S. hospitals, as shown in Exhibit 6.⁶

Electronic health records (EHR) were classified as either comprehensive or basic based on definitions previously developed by a consensus panel of health IT experts.⁷ As presented in our 2008 *Report on Health Information Technology in the United States: Where We Stand*, a basic EHR includes the following electronic functionalities implemented in at least one major clinical unit in the hospital: recording patient demographic information; clinical notes; and patient problem lists; viewing laboratory and imaging results; and using computerized prescription ordering. A comprehensive EHR includes all of the basic functionalities and an additional 14 functions implemented in all major clinical units.

The basic and comprehensive EHR definitions do not fully align with MU requirements; therefore we have created an additional variable to examine hospital's readiness for MU. The survey contains reasonable proxy measures for 12 of the 14 core criteria for MU (shown in Exhibit 7). As the MU criteria require that electronic functions support the care of a certain percentage of patients, the study considered a hospital to have met the criteria for MU if the required functionality was fully implemented in at least one major clinical unit OR fully implemented in all major clinical units. The standard of implementing in "at least one unit" is likely to be too generous for the bar set by MU; therefore the results are presented as an upper bound estimate.

Electronic Health Record Adoption Among U.S. Hospitals

In the first year of the federal financial incentive payments under HITECH, we found a substantial increase in the adoption of either a basic or comprehensive EHR (Exhibit 7). Both types of systems showed substantial increases from 2010 to 2011, with basic EHR rising from 11.5 percent to 18 percent, and comprehensive EHR rising from 2.6 percent to 8.7 percent. Consistent with prior years, characteristics of hospitals having at least a basic EHR included size, profit and teaching status, and location (Exhibit 8).

While these increases in overall adoption are encouraging, the results also show cause for concern. The gap in EHR adoption rates based on hospital size, teaching status, and location has become larger, indicating that hospitals with certain characteristics continue to adopt HIT at a faster rate than others. Adoption among large hospitals, for example, increased by 17.3 percentage points, as compared to 10.1 percentage points among smaller hospitals, widening the gap in adoption from 15.0 percentage points in 2010 to 22.8 percentage points in 2011. Similar differences were found based on teaching status and location.

Readiness for Meaningful Use Among U.S. Hospitals

We next examined hospitals' readiness for meaningful use (MU). Responders were categorized into two groups: hospitals closer to meeting MU had at least nine core functions fully implemented in at least one unit, while hospitals farther from MU had eight or fewer core functions fully implemented in at least one unit.

In 2011, 18.4 percent of hospitals met our proxy measure of readiness for MU by having all 12 core functions implemented in at least one unit (Exhibit 9), a substantial increase from 4.4 percent in 2010. These hospitals tended to be large, private nonprofit, teaching hospitals in an urban setting, consistent with characteristics of hospitals with high EHR adoption.⁸ Many hospitals nearly met our proxy requirements for MU, with 33.6 percent having between nine and 11 core functionalities in at least one unit (Exhibit 10). Although more than 50 percent of hospitals have achieved or have nearly achieved MU, 22 percent of hospitals have implemented fewer than five MU core functions. In addition, in 2011, 7.5 percent of hospitals had not implemented any core functionalities, remaining essentially unchanged since 2010.

Barriers to Meaningful Use

We next examined the group of hospitals that were close to meeting our proxy of MU (9 to 11 core functions implemented in at least one unit). In this group, close to half (47.1%) could not generate quality metrics, 40.0 percent had not implemented drug-drug and drug-allergy interaction checks, and 35 percent could not provide patients with a copy of their record upon request. Nearly 30 percent of these advanced hospitals had not implemented computerized physician order entry (CPOE) in any unit of the hospital. These findings suggest that these functionalities are the most challenging MU requirements to implement.

Exhibit 4: **Physicians' Intention to Apply for Incentives and Readiness for Stage 1 Core Objectives, by Physician and Practice Characteristics (2011)**

| Physician and Practice Characteristics | Percentage of Sample | Intention to Apply, Unadjusted | Among those with intention to apply, readiness for 10 stage 1 core objectives | | |
|--|----------------------|--------------------------------|---|-----------------------------|-----------------------------|
| | | | Unadjusted | | Adjusted ** |
| | | | Percentage | Percentage Point Difference | Percentage Point Difference |
| All Physicians | 100 | 51.3 | 20.5 | — | — |
| Age | | | | | |
| 45 Years Old or Younger | 25.5 | 57.6 | 25.5 | Reference | Reference |
| 45 to 54 Years Old | 28.3 | 57.5 | 18.6 | -6.9 | -6.0 |
| 55 Years Old or Older | 46.2 | 44.0* | 18.5 | -7.0 | -5.8 |
| Specialty | | | | | |
| Primary Care | 47.8 | 53.8 | 24.0 | Reference | Reference |
| Non-primary Care | 52.2 | 48.9 | 17.0 | -7.0* | -9.0* |
| Practice Size | | | | | |
| 1 to 2 Physicians | 39.2 | 38.9 | 15.1 | Reference | Reference |
| 3 to 10 Physicians | 45.2 | 57.7* | 18.7 | 3.6 | 1.2 |
| 11 or More Physicians | 15.6 | 63.6* | 33.6 | 18.5* | 14.3* |
| Ownership | | | | | |
| Physician or Physician Group | 64.5 | 53.0 | 16.1 | Reference | Reference |
| Other Ownership Arrangement | 35.5 | 48.1 | 29.5 | 13.4* | 11.1* |
| MSA Status | | | | | |
| MSA | 88.8 | 50.9 | 21.2 | Reference | Reference |
| Non-MSA | 11.2 | 54.1 | 15.4 | -5.8* | -4.4 |
| Eligible for Medicare Incentive | | | | | |
| No | 15.3 | 31.6 | 21.3 | Reference | Reference |
| Yes | 84.7 | 54.8* | 20.5 | -0.8 | -8.1 |
| Eligible for Medicaid Incentive | | | | | |
| No | 81.7 | 50.4 | 22.3 | Reference | Reference |
| Yes | 18.3 | 55.2 | 13.4 | -8.9* | -13.7* |

Source: Hsiao C, Decker S, Hing E, Sisk J. How ready are physicians for meaningful use? *Health Aff* (Millwood). 2012;31(5). [Epub ahead of print], archived and available at www.healthaffairs.org.

Notes: N=3,996. Data on physicians missing information on intention to apply for incentives, readiness for stage 1 core objectives, or ownership are omitted. MSA stands for metropolitan statistical area. Primary care specialties are defined as those in general or family practice, internal medicine, pediatrics, or obstetrics-gynecology. Readiness for stage 1 core meaningful use objectives was defined by having the following 10 capabilities: recording patient demographic information, recording patient problem list, recording medications, recording patient allergies, ordering prescriptions, sending prescriptions electronically to the pharmacy, providing drug-drug and drug-allergy warnings, providing patients with clinical summaries for each visit, capability to exchange patient clinical summaries electronically with other providers, and providing reminders for guideline-based interventions or screening tests. We considered a physician eligible for Medicare incentives if s/he had positive revenue from Medicare, and eligible for Medicaid incentives if s/he reported that at least 30 percent of her/his patients were on Medicaid (20.0% for pediatricians). Other ownership arrangements are defined as health maintenance organizations (HMOs), community health centers, medical/academic health centers, other hospitals, other health care organizations, and other.

* Significant difference relative to reference category based on a t-test ($p < 0.05$)

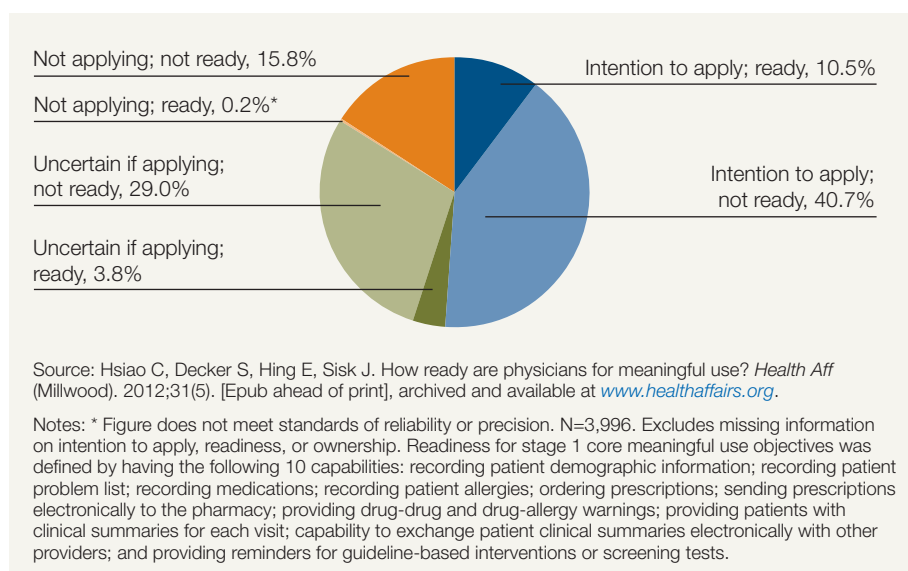
** Adjusted percentages consist of marginal effects from a logit model controlling for each variable listed in this exhibit.

Discussion

Physicians

In 2011, one-third of physicians had at least a “basic” EHR—one that would enable them to realize the potential to improve the quality and efficiency of care. While this represents significant growth since 2007, rates of adoption continue to vary by physician specialty, age, practice size, and ownership status. The data continue to show the ability of large practices with 10 or more physicians and those owned by HMOs, hospitals, and other health care organizations to adopt EHRs. However, physicians in these practices represent only a portion of all practicing office-based physicians. Approximately 39 percent of physicians were in practices with only one or two physicians, where adoption continues to lag.

Exhibit 5: Physicians’ Readiness for 10 Stage 1 Core Set Objectives, by Intention to Apply (2011)



The data also suggest there is a serious discrepancy between physicians’ intentions to apply for MU incentives and their readiness to meet the core objectives required for receiving payments. This is a more serious issue for the 85 percent of physicians likely to qualify for Medicare incentives, as they will receive lower payments if their first payment year is after 2013. Moreover, they face financial penalties in the form of reduced Medicare payments if they do not meet the MU criteria. Medicaid providers have more flexibility as they have six years of incentive payments that do not need to be consecutive, and they do not face reduced payments if they fail to adopt.

The trend data suggest an upturn in EHR adoption beginning in 2004, the same year President Bush issued the 2004 Executive Order that created the Office of the National Coordinator for Health Information Technology. The federal government, since that time, has supported processes for certifying EHRs, developing interoperability standards, measuring nationwide adoption, and establishing a national network of Regional Extension Centers (RECs) (Bell K. 2011. “From

the Chair: Passing the Baton.” *EHR Decisions: EHR Information and News*. <http://ehrddecisions.com/2011/02/09/passing-the-baton/>.) These RECs, targeted toward primary care providers, share best practices to support EHR adoption and MU.

The growth in overall adoption rates and enthusiasm for the MU incentive program are good news for federal policy-makers. However, these results also present areas of concern. Rates of adoption appear to have increased faster among certain groups of physicians, and no category of physicians has achieved a high level of adoption and readiness for MU. Federal policy-makers will need to successfully address these differential trends in EHR adoption by specialty, physician age, practice size, and ownership status in order to achieve the goal of widespread adoption. As the stage 2 MU criteria are being finalized, policy-makers must keep in mind that the large majority of physicians in the United States in 2011 could not meet the stage 1 criteria.

Exhibit 6: **Hospital Characteristics of Respondents Versus Non-Respondents**

| | | Respondents | Non-Respondents | P-value |
|-----------|-------------------|--------------------|--------------------|---------|
| | | N=2,646 (57.6%) | N=1,951 (42.4%) | |
| Size | Small | 54.4% | 45.6% | <0.001 |
| | Medium | 58.5% | 41.5% | |
| | Large | 69.8% | 30.2% | |
| Region | Northeast | 65.2% | 34.8% | <0.001 |
| | Midwest | 70.6% | 29.4% | |
| | South | 49.0% | 51.0% | |
| | West | 49.3% | 50.7% | |
| Ownership | For-Profit | 34.9% | 65.1% | <0.001 |
| | Private Nonprofit | 61.5% | 38.5% | |
| | Public | 63.9% | 36.1% | |
| Teaching | Major | 74.1% | 25.9% | <0.001 |
| | Minor | 63.5% | 36.5% | |
| | Not Teaching | 54.9% | 45.1% | |
| Location | Rural | 57.4% | 42.6% | 0.890 |
| | Urban | 57.6% | 42.4% | |

Source: DesRoches CM, Joshi M, Worzala C, Kralovec P, Jha AK. Small, non-teaching, and rural hospitals continue to be slow in adopting electronic health record systems. *Health Aff (Millwood)*. 2012;31(5). [Epub ahead of print], archived and available at www.healthaffairs.org.

Hospitals

During the first year of the federal financial incentive payment under HITECH, hospitals reported a substantial increase in EHR adoption and readiness for MU. The proportion of hospitals with at least a basic EHR has tripled since 2008. Similarly, hospitals' readiness for MU has increased more than four times from 2010 to 2011. With nearly 3,000 hospitals actively registered for the MU program in December 2011, these data suggest that the MU regulations are encouraging some hospitals to overcome barriers to EHR adoption.

While this progress is encouraging, many hospitals, however, have not made progress toward EHR adoption and MU. Using a relaxed proxy measure for ability to meet MU, more than 80 percent of hospitals were not able to meet these requirements. Furthermore, gaps in EHR adoption based on hospital characteristics continue to widen. Small, non-teaching, rural hospitals are falling further behind their larger, teaching, and urban counterparts. Finally, the proportion of hospitals with no MU functions has remained essentially unchanged since 2010, showing a lack of progress in EHR implementation. Although MU has encouraged some providers to adopt more comprehensive EHRs, as they formulate criteria for stage 2 MU, policy-makers must be mindful of the fact that the majority of physicians and hospitals cannot meet the stage 1 objectives.

As discussed in chapter 4, efforts to reform the delivery system will depend critically on HIT to facilitate and coordinate care. The Centers for Medicare & Medicaid Services (CMS) recently announced the final rules around accountable care organizations (ACOs) and while it did not explicitly require that hospitals within ACOs be meaningful users of EHRs, these ACOs will have a far more difficult time managing the care of their patient population without broad-based EHR adoption. Further, CMS is required by the ACA to reduce payments for certain types of re-admissions. This task will certainly be more difficult without the sharing of electronic data between hospitals and office-based physicians. Finally, CMS recently announced their value-based purchasing program. While the efforts in the first years are very modest, future value-based purchasing programs that require more robust performance across a wide variety of metrics will be much more difficult to implement without widespread EHR adoption.

Taken together, these findings suggest that there has been significant progress in EHR adoption among physicians and hospitals. However, the data also suggest that only a small minority of physicians and hospitals have the necessary systems in place to get to MU. How many physicians and hospitals ultimately achieve MU will depend on a series of factors, including the commitment of individuals and institutions, the readiness of the technology, and the effects of federal programs and related incentives.

Exhibit 7: **Variables Used to Create Meaningful Use Proxy**

| Meaningful Use Category | Meaningful Use Measure | Applicable 2010 Question: Does your hospital have a computerized system that allows for: | Standard to Meet Meaningful Use Per Analyses |
|--|--|---|--|
| Patient Information | | | |
| Patient Gender, Race, Ethnicity, and DOB | >50.0 % of all unique patients seen by the eligible provider (EP) or admitted to the eligible hospital's or critical access hospital's (CAH's) inpatient or emergency department (ED) [place of service (POS) 21 or 23] have demographics recorded as structured data | Patient gender, race, ethnicity, and DOB | Full implementation >1 unit |
| Patient Problem Lists | >80.0% of all unique patients seen by the EP or admitted to the eligible hospital's or CAH's inpatient or ED (POS 21 or 23) have <1 entry or an indication that no problems are known for the patient recorded as structured data | Patient problem lists | Full implementation >1 unit |
| Patient Medication Lists | >80.0% of all unique patients admitted to the eligible hospital have >1 entry (or an indication that the patient is not currently prescribed any medication) recorded as structured data | Patient medication lists | Full implementation >1 unit |
| Vital Signs | For >50.0% of all unique patients aged >2 years and overseen by the EP or admitted to eligible hospital's or CAH's inpatient or ED (POS 21 or 23), height, weight, and blood pressure are recorded as structured data | Vital signs | Full implementation >1 unit |
| Smoking Status | >50.0% of all unique patients aged >13 years seen by the EP or admitted to the eligible hospital's or CAH's inpatient or ED (POS 21 or 23) have smoking status recorded | Smoking status | Full implementation >1 unit |
| Patient Medication Allergy Lists | >80.0% of all unique patients seen by the EP or admitted to the eligible hospital's or CAH's inpatient or ED (POS 21 or 23) have >1 entry (or an indication that the patient has no known medication allergies) recorded as structured data | Comprehensive list of allergies (including allergies to medication) | Full implementation >1 unit |
| Order Entry | | | |
| CPOE | >30.0% of unique patients with >1 medication in their medication list seen by the EP or admitted to the eligible hospital's or CAH's inpatient or ED (POS 21 or 23) have >1 medication order entered using computerized physician order entry (CPOE). Implement 1 clinical decision support (CDS) rule | CPOE for medications | Full implementation >1 unit |
| CDS | Implement 1 CDS rule | CDS for guidelines, reminders, allergies, drug interactions, laboratory interactions, or dosing support | Full implementation >1 unit |
| Implement Drug–Drug And Drug–Allergy Interaction Checks | EP/eligible hospital/CAH has enabled this functionality for the entire EHR reporting period | | Full implementation >1 unit |

Exhibit 7: **Variables Used to Create Meaningful Use Proxy (continued)**

| Meaningful Use Category | Meaningful Use Measure | Applicable 2010 Question: Does your hospital have a computerized system that allows for: | Standard to Meet Meaningful Use Per Analyses |
|---|--|--|--|
| Reporting/Patient Interaction | | | |
| Generate quality measures | For 2011, provide aggregate numerator, denominator, and exclusions through attestation as discussed in section II(A)(3) of this final rule. For 2012, electronically submit the clinical quality measures as discussed in section II(A) (3) of this final rule | Automatically generate HQA or PQRI Quality Reporting by extracting from an EHR without additional manual processes | Yes/No |
| Provide patient copy of record upon request | >50.0% of all patients of the EP or the inpatient or EDs of the eligible hospital or CAH (POS 21 or 23) who request an electronic copy of their health information are provided it within 3 business days | Providing patients an electronic copy of their record | Yes/No |
| Electronic copy of discharge Instructions | >50.0% of all patients of the EP or the inpatient or EDs of the eligible hospital or CAH (POS 21 or 23) who request an electronic copy of their health information are provided it | Discharge summaries | Full implementation >1 unit |
| Exchange key clinical information | Performed ≥ 1 test | No measure | |
| Privacy and security | Capabilities conduct or review a security risk analysis per 45 CFR 164.308 (a)(1) and implement security updates as necessary and correct identified security deficiencies as part of its risk management process | No measure | |

Notes:

ED—emergency department
CAH—critical access hospital
EP—eligible provider
POS—place of service

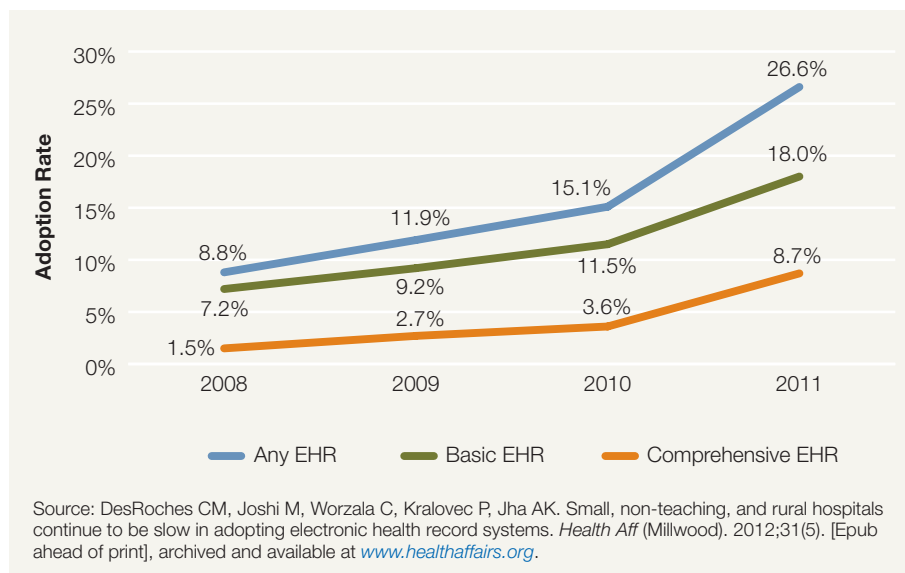
Exhibit 8: **Changes in Adoption of Basic and Comprehensive EHRs**

Exhibit 9a: **Percentage of Hospitals With Comprehensive or Basic EHR (2008–2011), by Size**

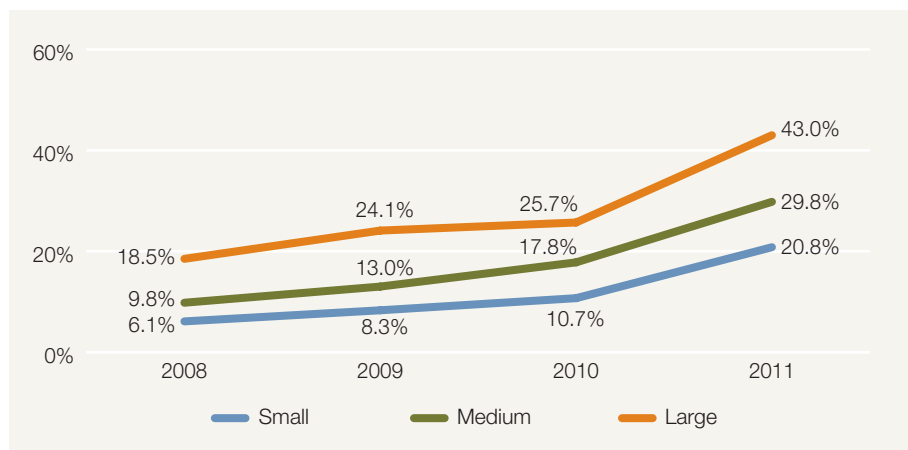


Exhibit 9b: **Percentage of Hospitals With Comprehensive or Basic EHR (2008–2011), by Teaching Status**

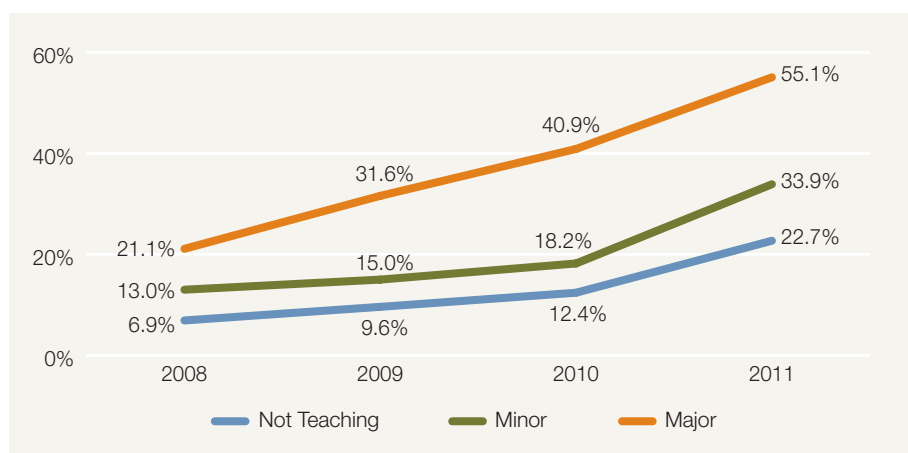
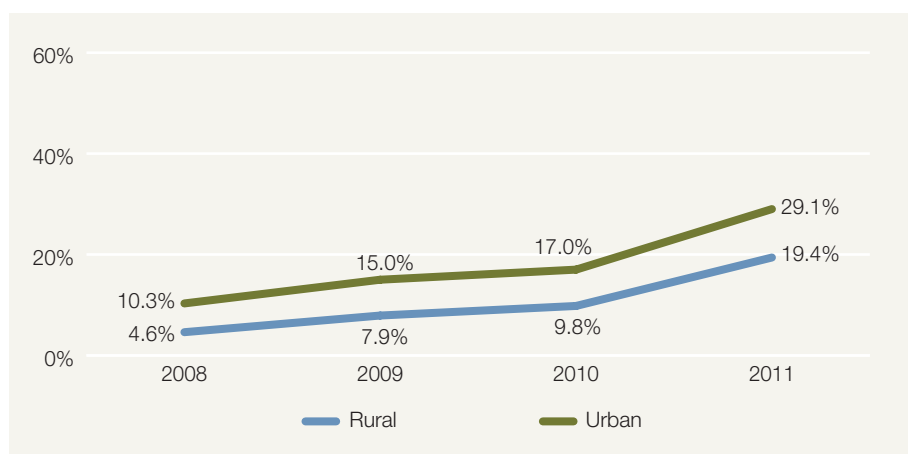


Exhibit 9c: **Percentage of Hospitals With Comprehensive or Basic EHR (2008–2011), by Location Type**



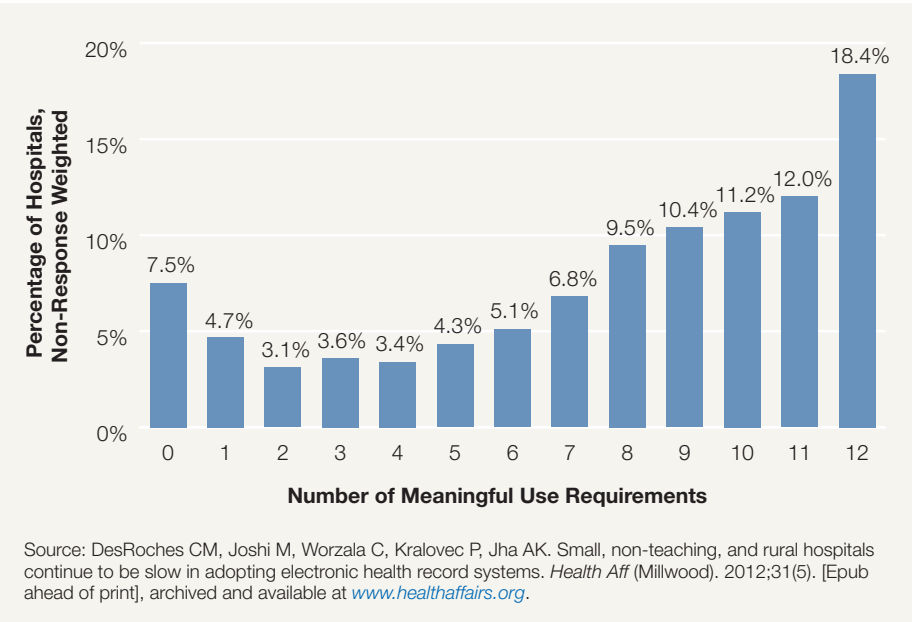
Source: DesRoches CM, Joshi M, Worzala C, Kralovec P, Jha AK. Small, non-teaching, and rural hospitals continue to be slow in adopting electronic health record systems. *Health Aff (Millwood)*. 2012;31(5). [Epub ahead of print], archived and available at www.healthaffairs.org.

Exhibit 10: **Hospital Characteristics by Meaningful Use, Non-Response Weighted**

| | | Meaningful Use 18.4% | No Meaningful Use 81.6% | P-value |
|------------------|--------------------------|-------------------------|----------------------------|---------|
| Size | Small | 13.9% | 86.1% | <0.001 |
| | Medium | 21.2% | 78.8% | |
| | Large | 29.7% | 70.3% | |
| Region | Northeast | 20.3% | 79.7% | 0.011 |
| | Midwest | 18.8% | 81.2% | |
| | South | 20.0% | 80.0% | |
| | West | 13.4% | 86.6% | |
| Ownership | For-Profit | 12.5% | 87.5% | <0.001 |
| | Private Nonprofit | 21.2% | 78.8% | |
| | Public | 15.5% | 84.5% | |
| Teaching | Major | 37.1% | 62.9% | <0.001 |
| | Minor | 22.8% | 77.2% | |
| | Not Teaching | 15.9% | 84.1% | |
| Location | Rural | 12.9% | 87.1% | <0.001 |
| | Urban | 20.3% | 79.7% | |

Source: DesRoches CM, Joshi M, Worzala C, Kralovec P, Jha AK. Small, non-teaching, and rural hospitals continue to be slow in adopting electronic health record systems. *Health Aff (Millwood)*. 2012;31(5). [Epub ahead of print], archived and available at www.healthaffairs.org.

Exhibit 11: **Number of Core “Meaningful Use” Functions Implemented**



Endnotes

1. Hsiao C, Decker S, Hing E, & Sisk J. How ready are physicians for meaningful use? *Health Aff* (Millwood). 2012;31(5). [Epub ahead of print], archived and available at www.healthaffairs.org.
2. A basic EHR through 2009 included six (recording patient demographic information; clinical notes; and patient problem lists; viewing laboratory results; viewing imaging results; and using computerized prescription ordering) of the seven features that were mentioned in the first RWJF report on EHRs (*Health Information Technology in the United States: Where We Stand*, 2008). Basic EHRs in 2010 and 2011 included additional features: “medication list” in 2010, and “allergies list” in 2011.
3. Hsiao CJ, Hing E, Socey TC and Cai B. *Electronic Health Record Systems and Intent to Apply for Meaningful Use Incentives Among Office-Based Physician Practices: United States 2001–2011*. NCHS data brief, no 79. Hyattsville, MD: National Center for Health Statistics; 2011.
4. Decker S, Jamoom E, Sisk J. Who’s behind the curve? A decade of physician adoption of electronic health records, 2002–2011. *Health Aff* (Millwood). 2012;31(5). [Epub ahead of print], archived and available at www.healthaffairs.org.
5. Meaningful Use, as specified by the American Recovery and Reinvestment Act of 2009, is the use of a certified EHR technology in a meaningful manner (such as e-prescribing), for electronic exchange of health information to improve quality of health care, and to submit clinical quality and other measures. Please see DesRoches C and Painter MW. (eds). 2010. *Health Information Technology in the United States: Moving Toward Meaningful Use*, 2010. Princeton, N.J.: The Robert Wood Johnson Foundation.
6. Woodbridge JM. Inverse probability weighted estimation for general missing data problems. *Journal of Econometrics*. 2007;141(2):1281–1301.
7. Jha AK, DesRoches CM, Campbell EG, et al. Use of electronic health records in U.S. hospitals. *New England Journal of Medicine*. 2009;360(16):1628–1638.
8. The survey includes a measure of whether a hospital is participating in health information exchange; however, it is a poor proxy for the stage 1 meaningful use criteria focused on data exchange. The survey item measures a much higher level of exchange than is required by the criteria, asking hospitals if they participate in a regional health information exchange with unaffiliated providers. The meaningful use criteria only require hospitals to attest to performing a test exchange with another entity.

Chapter 2: Health Information Exchange Under HITECH: Early Findings

Julia Adler-Milstein, PhD and Ashish K. Jha, MD, MPH, Harvard School of Public Health

Executive Summary

Many of the challenges facing the U.S. health care system could be remedied with better access to information and greater ability to aggregate and analyze it. Enabling the seamless flow of clinical data across health care delivery settings should fuel dramatic improvements in the quality and efficiency of care. Currently, there are substantial public and private-sector efforts to increase the flow of clinical data across providers. Some of these efforts to increase health information exchange (HIE) are happening at the local, community level. Other efforts are regional, crossing multiple communities or even states, and there are federal level efforts to ensure that there is the ability to exchange clinical data among geographically distant providers.

Once HIE capabilities are in place, the hope is that the information can be aggregated and analyzed to improve health system performance. These expectations have motivated the federal government to fund states to expand HIE capabilities and include HIE as a key part of the definition of meaningful use of electronic health records (EHRs), the criteria used by the U.S. government to pay incentives to providers and hospitals under the Health Information Technology for Economic and Clinical Health (HITECH) Act. However, achieving the broad-based HIE that leads to better, safer care and substantial financial savings is fraught with challenges and the best approach remains elusive.

With simultaneous activity to promote HIE at the local, state, and federal level, it is a crucial time for national HIE efforts. In this chapter, we begin by describing the key policy efforts to promote HIE. We summarize the most recent data on HIE and then discuss approaches to increasing HIE currently being pursued at each level (local and regional, state, and federal). Given that states have become central to promoting broad-based HIE, we detail the various state activities and the approaches they are taking. We conclude with a discussion of the policy implications and future activities that may be undertaken by federal policy-makers. Throughout each section we highlight the major obstacles that need to be addressed to ensure that health information flows electronically in order to improve the performance of the health care system.

Introduction

A pillar of the current national effort to wire the U.S. health care system is ensuring that health information can flow electronically among key stakeholders, including physicians, hospitals, providers of diagnostics tests, and patients. Studies that have used modeling techniques suggest that fully implemented HIE could result in large savings¹ as well as fewer medical errors and improved clinical decision-making² by making more complete information available to providers and to patients. Beyond improving the efficiency and effectiveness of the care delivery, HIE can have

important benefits in promoting secondary uses of clinical data. For example, clinical data repositories can be set up to facilitate research in the comparative effectiveness of various treatments. Aggregated data can support a more comprehensive assessment of provider performance, which can be used for public reporting or for pay-for-performance. In the public health sphere, HIE enables syndromic surveillance that can identify and enable a more rapid response to disease outbreaks.³

Despite the significant potential for HIE to tackle some of the biggest challenges facing health care, progress toward broad-based HIE has been increasing slowly. While there are many factors that have slowed broad-based HIE, the most fundamental, and most challenging, is that those who own and control the data, health care providers, have no clear business need for HIE. In response, policy-makers have attempted to create the conditions in which HIE will flourish, with the hope that broad-based HIE will serve as the foundation for performance improvement efforts. While the centerpiece of the 2009 HITECH is promoting the adoption and meaningful use of electronic health records, the Act emphasizes the notion that increasing reliance on electronic information systems without the complementary ability to exchange data significantly limits the value of such systems. Whether the resulting policies will successfully kick-start progress toward nationwide HIE, and whether, in turn, increased access to information successfully enables broader improvements in health system performance remain uncertain.

Policy Context

HITECH includes several substantial efforts to promote broad-based HIE. The two primary strategies are (1) the inclusion of HIE in the federally defined meaningful use criteria and (2) the creation of the State HIE Cooperative Agreement Program. When Congress passed HITECH, they specified that the ability to engage in HIE is a key part of “meaningful use” (MU) of EHRs. The HITECH law in turn, prompted the MU criteria that providers must meet to receive financial incentives for adopting EHRs. In the first stage of the incentive program, the criteria for MU require that providers demonstrate the capability to exchange data (a “core” criteria) and also include several types of HIE as part of the more flexible “menu” criteria. In future stages of the program, more robust HIE is expected to be required.⁴

Part of the motivation for beginning with less stringent HIE requirements is that few providers have accessible, affordable options to send and receive data electronically, even if they have an EHR with this capability. The primary options that may be available to providers who want to electronically exchange data with entities outside their organization are as follows. They can set up technical interfaces and individual data sharing agreements with others in their community; however, such interfaces are expensive¹ and require maintenance. Providers can also use technical standards and services established through the Direct Project (<http://wiki.directproject.org/>), which rely on the Internet to securely push data from one authorized user to another. These are still in their infancy and will operate like an email “inbox” (with added security and authorization), as opposed to supporting seamless end-to-end integration between EHRs.²

In some communities, health care stakeholders collaboratively have come together to set up the governance, policies, technical services, business operations,

and financing mechanisms to support an entity that facilitates HIE. Providers may therefore have the option to join one of these so-called regional health information organizations (HIOs). This approach offers several advantages. Because HIOs are locally based, they are more likely to engender trust and are often customized to ensure that their offerings meet the needs of the local stakeholders. Through a single connection, providers can exchange data with other participating providers and stakeholders (such as laboratories or public health departments). They also rarely require substantial technical expertise from providers and are viewed favorably by both providers⁵ and patients.^{6,7} However, HIOs also face an array of challenges that impede their ability to support broad-based HIE on an ongoing basis.

Finally, many hospitals have developed individual arrangements with community-based physicians to share clinical data electronically.⁸ While hospital-community physician exchange leads to greater exchange of clinical data, it is not clear whether such arrangements will lead to broad-based HIE or whether hospitals are viewing HIE as a strategic investment to increase referral volume by tying community-based physicians to particular hospitals. The latter case may lead to islands of exchange, limiting the societal value from HIE.

Given the patchy and uncoordinated HIE options, HITECH created a program to coordinate and expand HIE in every state.^{9,10} The State HIE Cooperative Agreement Program awarded a total of \$548 million in funding to 56 states, eligible territories, and qualified state designated entities (SDEs).¹¹ Over the four-year program period, awardees are responsible for ensuring that there is infrastructure in place to allow providers to share clinical data easily across care settings. States are in the early stages of implementing their plans to meet these responsibilities, and most are focusing on creating options for providers to comply with stage 1 MU criteria. (Please see chapter 1 for a description of stage 1 meaningful use.) Within these broad goals, states are pursuing a variety of approaches that range from highly centralized to highly decentralized. For example, some states are building a single statewide HIE infrastructure, and others are focused on bolstering local and regional efforts to facilitate HIE and then connecting these nodes.

The Current State of HIE: What Is Happening at the Local and Regional Levels?

Since the majority of HIE activity prior to HITECH occurred at the local and regional levels through HIOs, and many states are pursuing approaches that involve building on existing HIOs, this section summarizes the current evidence on their activity and the key challenges to their viability.

Data on HIO Activity

There have been two recent efforts to assess HIO activity and sustainability. In early 2010, we conducted a national survey of HIOs.¹² We found that there were 80 operational organizations (i.e., clinical data exchange was taking place between independent entities) and 82 were in the planning phase. Within the 80 operational organizations, hospitals were the most common type of data provider (in 84.0% of HIOs), followed by laboratories and imaging facilities (in 71.0%). The two most common types of data receivers were hospitals and ambulatory practices

(in 83.0% of HIOs and 77.0% of HIOs, respectively). Other types of stakeholders, such as pharmacies, public health departments, and payers, provided and received data less often. Test results were the most common type of data exchanged by operational HIOs (in 88.0% of HIOs), followed by demographic data from the outpatient and inpatient settings (in 76.0% and 72.0%, respectively). Overall, 721 U.S. hospitals (14.0% of U.S. acute care hospitals) and 6,879 ambulatory practices (3.0% of U.S. practices) participated in HIOs that are currently operational.

Recurring subscription- or transaction-based fees from participating entities were the most substantial form of support received once the HIO became operational (i.e., actively facilitating HIE). This support stands in sharp contrast to the grants, appropriations, or contracts from governments, which provided primary support for HIOs prior to becoming operational, reflecting progress toward financial sustainability. However, almost half of the operational organizations continued to cite grant funding as a moderate or substantial form of support, indicating the substantial challenges that many HIOs face in trying to achieve a sustainable revenue model.

We assessed the ability of HIOs to help providers meet stage 1 meaningful use criteria. While participation in an HIO is not required to achieve MU and several types of exchange required under stage 1 meaningful use, like ePrescribing, are already occurring, HIOs represent an important approach to enabling providers to engage in HIE. We found that 13 HIOs (17.0%) supported the types of data exchange included in the stage 1 MU criteria, of which six (8.0% of all HIOs) could support both the required (core set) and optional (menu set) data exchanges. The 13 HIOs encompassed 168 hospitals (3.0% of all acute care hospitals) and 2,007 ambulatory practices (0.9% of all U.S. practices). Of the core set measures, 44 HIOs (55.0%) supported exchange among ambulatory practices and hospitals (which should enable participating providers with a certified EHR to demonstrate their ability to exchange data); 21 (26.0%) supported e-Prescribing; and 18 (22.0%) offered quality reporting.

While helping providers achieve MU is an important objective and one that will help HIOs become more sustainable, the vision for HIOs is that they will support the breadth of exchange that will enable the improvement of the health care system. To help define what this exchange would require, our study convened a panel of national policy experts with a range of HIE expertise and asked them to specify the characteristics of an HIO that would improve the quality and efficiency of care. The consensus was that a comprehensive effort had to include a range of stakeholders, beyond doctors and hospitals to pharmacies, labs, and payers, and had to exchange a robust set of clinical data (e.g., physician notes, problem and medication lists, public health reports). When we assessed the number of HIOs that could, as of end of 2009, meet the definition of comprehensive, we found none. This paucity suggests that HIOs are far from being able to support the robust data exchange that is likely required to realize the projected quality and efficiency gains from HIE.

More recently, the eHealth Initiative (eHI) conducted a national survey of HIE initiatives.¹³ They found a similar number of operational initiatives (n=85) and a slightly larger number of those in the planning stages (n=98). Similar to our survey, they also found that hospitals and physicians were the most common participants in data exchange, and that laboratory results were the most common type of data

exchanged. Of the 85 operational initiatives, they were able to assess the financial sustainability of 75, and 24 (32.0%) met their definition of sustainable (supporting themselves through non-federal operational revenue alone).

The eHI survey found a larger number of initiatives that could support stage 1 MU criteria. This finding likely reflects progress over the 18 months between our survey and theirs, as well as modest variations in the definitions for what constitutes the ability of an HIO to support stage 1 MU. For the core meaningful use criteria, they found that 60 operational initiatives (80.0%) supported connectivity between EHRs. Thirty-two initiatives (43.0%) supported ePrescribing and at least 16 initiatives (21.0%) supported quality reporting. Many initiatives also supported the types of exchange that have been proposed for stage 2 MU criteria, suggesting that they are beginning to target their approach toward both the current and future MU criteria.

Progress and Challenges at the Local Level

While these studies reflect HIO progress, they also point to the challenging road to success resulting from the wide array of barriers facing these organizations, as well as the reality that there is a long way to go before HIOs support the comprehensive HIE that substantially improves care quality and efficiency. Challenges related to funding and sustainability are common and particularly difficult to overcome.^{12, 14, 15} The technical infrastructure supporting HIE is expensive to set up and many potential participants are hesitant to financially support these efforts without a clearer sense of the timing and likelihood of benefits. In 2008 the Congressional Budget Office refused to score the financial savings from HIE given the paucity of data,¹⁶ and we continue to lack rigorous evaluations that carefully demonstrate meaningful impact of these organizations. In particular, the distribution of costs and benefits requires further assessment as providers feel that they are being asked to shoulder the majority of the cost while payers and patients reap the benefits from reduced redundancy and improved quality. Payers, in turn, are hesitant to support HIOs because they are uncertain whether they will be viable in the long run and feel that they have limited ability to ensure that providers use newly available data to make better care decisions. Funding through HITECH should be helpful—both directly by providing additional financial support, and indirectly by increasing provider demand for HIE. However, HITECH funding is not sufficient (nor intended) to ensure long-term sustainability.

Beyond the financial barriers, there are five additional types of barriers that must be overcome. First, stakeholders' have serious concerns about data privacy and security as well as legal or regulatory challenges if there is a data breach or unauthorized access. HIE is an emerging area with limited legal precedent and an array of state and federal regulations affecting it. HIOs must identify the relevant laws, most of which were developed without consideration for HIE, and interpret their applicability. Second, given the highly sensitive nature of patient health information, issues like data ownership and protocols for user authentication and access must be clarified. Participants may have different and even perhaps conflicting perspectives on acceptable solutions. Achieving consensus requires strong governance and organizational capabilities that many small collaborative efforts lack.

Third, HIE is a network technology, which means that the value provided by an HIO grows exponentially with increasing stakeholder participation. The first set of providers that shares their data will realize much less value than the second, third, fourth, etc. As more providers join in, each has a more complete set of data on their patients. Therefore, if HIOs are not successful at convincing stakeholders, and in particular, the large stakeholders in the community, to contribute data early in the process, those using the HIO bear substantial costs while getting very little value. This result could penalize early adopters and makes it difficult to achieve a tipping point.

Fourth, potential participants may be concerned about the competitive implications of participating in an HIO.¹⁷ The initial step of agreeing to discuss a collaborative effort may be unrealistic in a highly competitive market. Our recent empirical work in this area found that competitive concerns appeared to be a major reason holding many hospitals back from joining regional HIE efforts. Even if competitors agree to preliminary discussions, providers have to weigh whether they will lose more patients than they will gain if they make it easier for patients to seek care from their competitors by participating in an HIO. This concern is particularly salient for hospitals who view clinical data as “a key strategic asset, tying physicians and patients to their organization.”¹⁸

Fifth, there is an array of challenges to making HIE work on the front lines of care delivery. When participants do not have EHRs, HIE requires manual data entry or viewing that can take a substantial amount of time and disrupt their workflow. Even if EHRs are in place, it is rare to have seamless end-to-end integration and HIE is often set up such that providers have to log in to a separate system. This disruption in workflow dramatically reduces the frequency with which HIE is used. For HIE to be successful at improving care, providers often have to make substantial changes in their workflow to incorporate newly available data. Making these changes requires organizational capabilities that are often absent in small practices.

These barriers, together with our findings that HIOs have limited coverage and no HIOs met the expert panel definition of a “comprehensive” effort, suggest that the infrastructure for, and provider engagement with, HIE are both still in their infancy. They also reflect just how hard it is to achieve sustainable, broad-based HIE, underscoring the importance of the state-based efforts to increase options for providers to participate in HIE. States, which have become the focal point for HIE under HITECH, have significant work ahead of them. Therefore, in the next section, we discuss state approaches to foster HIE and progress to date.

States' Approaches to Increase HIE

Overview of State Approaches

Under the State HIE Cooperative Agreement Program, states (or state-designated entities) received funding to develop plans to increase the level of health information exchange. At a minimum, all states must create options for providers to comply with stage 1 meaningful use. This requirement means that there are three particular types of HIE that states must pursue: (1) ePrescribing, (2) receipt of structured lab results, and (3) sharing patient care summaries across unaffiliated organizations.¹¹ However, many states are planning to pursue more comprehensive HIE. States developed

Strategic and Operational Plans, which passed through an approval process by the Office of the National Coordinator for Health Information Technology (ONC), and the majority of states are now implementing their approved plan.

At a high level, state approaches to fostering HIE under the Cooperative Agreement Program have been characterized into four types (created and defined by Deloitte):

- **Elevator.** States with an elevator model focus on rapid facilitation of exchange capabilities to support stage 1 MU. These states are typically starting with very limited HIT adoption and exchange activity locally or at the state level. Thus, they need to rely on a technical approach that can be built quickly and does not require mature infrastructure. The Direct Project protocols (described in more detail below) therefore offer a compelling way to increase HIE and form the backbone of the many elevator states.
- **Capacity-Builder.** States with a capacity-builder model focus on bolstering sub-state (i.e., local) exchanges through financial and technical support. In states with existing operational or planned HIOs that have comprehensive geographic coverage, states seek to leverage these efforts and focus state resources on shoring up any gaps in their ability to support stage 1 MU. This move is accomplished by providing financial and technical resources that are tied to performance goals, such as increasing scope (i.e., types of exchange supported) or scale (number of participating providers).
- **Orchestrator.** States with an orchestrator model focus on building the basic services required to connect existing substate exchanges to create a state-level network. This approach is particularly appealing for states that are starting from the same place as capacity builders but place more emphasis on state-level exchange. Connecting substate nodes allows information to flow across the state. The orchestrator model also appeals to states with diverse local HIE approaches [e.g., a mix of HIOs, integrated delivery networks (IDNs), hospital-based exchanges]. Since some of these entities, like IDNs, are likely unwilling to expand to include any provider who wants to join, the capacity-builder approach would not successfully create options for all providers to engage in exchange. Instead, the orchestrator model provides the minimal necessary services to connect existing exchanges as well as individual providers who are not part of an existing effort.
- **Public utility.** States with a public utility model focus on providing a wide spectrum of HIE services directly to end users and to substate exchanges where they exist. This model places the state at the center of HIE activity by building a single hub for exchange. Such a model is particularly well suited to small states who can obtain sufficient stakeholder buy-in, as well as states with sufficient authority and resources to build statewide infrastructure. Given the burden placed on the state, this model typically appeals to states that have been working to build a state-level exchange prior to the state HIE Cooperative Agreement Program and therefore, have laid the groundwork, as well as have the expertise required to pursue a more centralized approach.

In reality, these models are not mutually exclusive and many states are pursuing hybrid approaches. Often, states plan to begin by pursuing one model, such as the elevator model (which supports rapid development of capabilities to support stage 1 meaningful use). Over time, these states may want to broaden their efforts to support more robust HIE and therefore, plan to grow toward a different model, such as an orchestrator. In other states, particularly large states, hybrid models are

being pursued because there are different needs and different pre-existing levels of HIE in various regions. A range of considerations shapes the model a state chooses to pursue and it is unlikely that there is an “ideal” approach for a given state.

Technical Services Provided by States

The majority of state activity is focused on selecting and implementing a set of HIE-related services that facilitate their chosen model. Common services include clinical summary record exchange, patient matching, and authoritative statewide provider directory. Clinical summary record exchange, which involves creating a single patient record for exchange by compiling available data from multiple sources, is likely broadly supported because such exchange is included in MU. Patient matching is a service that enables a clinical summary record to be created and facilitates other types of exchange that seek to determine whether data from disparate sources is tied to the same patient. Similarly, an authoritative statewide provider directory indirectly facilitates exchange by uniquely identifying providers so that they can be verified to ensure that they should be receiving a given piece of information (or to verify the source sending a given piece of information).

Another important set of services relates to whether and how states support the Direct Project protocols. Launched in March 2010 as a component of the Nationwide Health Information Network (NHIN), the Direct Project is a set of standards, policies and services that offers a secure solution to support simple point-to-point forms of exchange between authorized providers. If states choose to support Direct, they must follow a specific set of activities to facilitate it. First, they select one or more entities to serve as a health information service provider (HISP), which then assigns all providers a Direct email address (which is distinct from any person or professional email addresses that a provider might already be using). Then, to use Direct, the provider logs into his or her HISP Direct gateway via the Internet and uses his or her Direct email address to send information to another provider who also has a Direct email address. Information can be sent only to other providers using the Direct service. Direct is a very flexible approach to facilitate data transport because organizations, as well as individuals, can receive authorized Direct addresses. Some states are therefore likely to use it for a wide-range of HIE use cases, such as lab results reporting, interstate exchange, and public health reporting.

Challenges and Barriers

The majority of states are in the early stages of implementing their Cooperative Agreement Program plan. Many of the barriers facing states are similar, if not identical, to those facing local HIOs, such as inadequate stakeholder collaboration, budget limitations, uncertainty about privacy regulations, and ensuring that their approach supports the evolving HIE and health reform landscape. For example, many states find it difficult to convince providers who are not included in the MU incentive program (such as nursing homes or rehabilitation hospitals) to participate in state HIE efforts because they lack the same incentives to participate in information exchange. In states with low EHR adoption rates, providers are focused on implementing EHRs to meet stage 1 meaningful use. Since stage 1 MU does not require robust HIE, it is difficult to convince providers to look beyond stage 1 and focus their limited attention and resources on HIE.

Tight budgets can pose a challenge for states trying to provide HIE services that carry large up-front costs. This challenge is further exacerbated by delays receiving federal implementation funds and nascent sustainability plans. States are also concerned that the federal privacy rules have not yet been released, which invokes uncertainty about how they will be interpreted. Finally, it is difficult to keep abreast of changes to the Cooperative Agreement Program requirements alongside the broader set of activities related to other HITECH initiatives (e.g., the Beacon program) and health reform more generally.

Policy Implications and Future Federal Activities

It remains to be seen how successful states will be in implementing their plans by the end of the relatively short program period, and what will happen to those that fall short of their goals. There are several ways in which the federal government could increase the likelihood that states are successful in expanding HIE. A critical factor in the success of these initiatives is likely to be robust requirements for HIE in later stages of MU, which would create provider demand for HIE. Creating such demand is the only way, short of mandates, that providers are likely to choose to participate and support local or state HIE efforts. This point is particularly crucial because states are required to develop sustainability models to support HIE after the end of the Cooperative Agreement Program. It will be difficult for them to do so if there is not a baseline level of interest in HIE from key stakeholders like hospitals and physician practices.

One of the criticisms of the MU program is that it excludes many types of health care stakeholders, such as long-term-care facilities. This critique is particularly detrimental to HIE efforts in two ways. First, one of the goals of HIE is to support care coordination. If key data is missing from exchange efforts, it decreases the value of such exchange and lessens enthusiasm for supporting it. Second, the exclusion of a subset of stakeholders narrows the base on which HIE efforts can draw for ongoing support. This exclusion makes sustainability more difficult and is one of the reasons that many states are reaching out to these stakeholders to try to provide services they will value. The federal government could facilitate this process by creating incentives for these excluded providers to participate in HIE.

While it is important for policy-makers to focus on the success of HITECH, we will eventually need to move beyond the requirements of meaningful use. In order for HIE to facilitate health system improvement, we will need clinical data to be widely available for clinical use. Further, these data have to be available in ways that can be aggregated and analyzed for secondary activities such as provider performance profiling and comparative effectiveness research. Two current trends threaten this use. The aggressive timelines of the MU program forced ONC to develop the Direct protocols very quickly. While Direct enables data transport, the unstructured exchange it supports means that the exchanged data cannot be analyzed by computers, which prevents aggregation, surveillance, and other key activities. If the federal government does not require structured exchange, most providers are unlikely to engage in structured data exchange, especially without better interoperability solutions and wider agreement on vocabulary-based standards. In order to reap the full value of HIE, federal policy officials have to either find ways to get providers to engage in structured data exchange, or invest in new technologies, such as natural language processing,¹⁹ which have the potential to allow better use of unstructured data.

A second important trend that the federal government should monitor is whether HIE is occurring across a range of unaffiliated providers, or whether “islands of exchange” are being created. Certain stakeholders are likely to see a competitive advantage to strategically sharing data with only a subset of providers in the market (i.e., referring physicians, nursing homes). This move would, in turn, create potentially greater market fragmentation with such islands of HIE effectively locking patients into a group of providers. If this additional fragmentation occurs, and we think the likelihood is substantial,^{17, 18} it will be critical for federal policy-makers to create stronger incentives, financial or otherwise, to overcome these market pressures.

Finally, it is important that federal government continue to work to align various incentive programs in ways that promote health information exchange. The Patient Protection and Affordable Care Act (PPACA) lays the groundwork to transform the health care system. An important component is the Medicare Shared Savings Program for accountable care organizations (ACOs). The ACO program in its current form requires a high level of care coordination, and therefore a high level of health information exchange (see chapter 4 on health IT and health care delivery reform). Creating greater incentives for robust HIE outside of HITECH will engage a broader range of stakeholders who will provide ongoing support for HIE efforts.

Conclusion

We are at a unique moment in the evolution of HIE in which funding and momentum at federal, state, and local levels are peaking. While this progress will undoubtedly increase the amount of data that flows electronically between key health care stakeholders, how close we get to achieving the vision of seamless HIE that is leveraged to improve health care quality and value is an open question. The challenges are very real and lack easy solutions, as has been evident in the struggle of many HIOs over the past decade to become sustainable. Ultimately, it will take a combination of favorable policy efforts that create an environment in which providers and other stakeholders see clear value in participating in HIE. It will require a better understanding of how to best enable HIE to occur—from a technical, legal, privacy and security, sustainability and workflow perspective—and a persistent focus on ensuring that HIE is not an end in itself but instead helps achieve broader performance improvement. Failing to achieve comprehensive HIE will severely impair the value of our \$30 billion federal investment in EHRs; successfully achieving it could serve as the launching pad for a wide range of initiatives that targets the dual aims of significantly reducing the cost of health care while improving quality.

Case Study: Indiana Health Information Exchange and Public Reporting of Quality Measures

The Indiana Health Information Exchange (IHIE) operates the nation's oldest and largest health information exchange, partnering with communities throughout Indiana to ensure that information critical to improving care coordination and patient outcomes is available when and where it is needed. The IHIE connects hospitals, rehabilitation centers, long-term-care facilities, laboratories, imaging centers, clinics, community health centers, and other health care organizations. In 2010, the IHIE teamed with Health Care Excel, Indiana Minority Health Coalition, Indiana Coalition for Patient Safety, Indiana Patient Safety Center, Indiana Hospital Association, Indiana State Department of Health, and the state of Indiana to form the Central Indiana Alliance for Health, funded under the Robert Wood Johnson Foundation's *Aligning Forces for Quality: The Regional Market Project (Aligning Forces)*. *Aligning Forces*, launched in 2006, supports 16 communities across the United States with the goal of helping improve the overall quality of health care provided while simultaneously reducing racial and ethnic disparities.

Central Indiana was funded under *Aligning Forces* at a later date than most of the other communities. It was believed at the time that Central Indiana was well positioned to achieve the ambitious goals of *Aligning Forces*, despite the shortened time frame, due to robust efforts at data exchange that were already taking place in the region with the IHIE. In fact, the project did make significant gains in several areas. However, Central Indiana was not able to make sufficient progress on one of the central *Aligning Forces* goals: public reporting of quality measures. That failure ultimately resulted in the termination of funding from the *Aligning Forces* initiative. The story of why Central Indiana could not meet this public reporting goal, despite having the largest health information exchange in the country, offers valuable insights into the challenges that lie ahead for any community attempting to implement widespread public reporting using data from health information exchanges.

Stakeholders in Central Indiana expressed a willingness to engage in public reporting; however, there were numerous obstacles to the public release of this type of data, even in a market with an advanced data exchange. These obstacles included:

- **Cultural barriers:** Although the IHIE's Quality Health First Program had been producing quality performance reports since 2008, their focus was on providing feedback to primary care physicians, not public reporting. Given that publicly reporting physicians' performance can be disruptive, the project team felt that they did not have adequate time to build support for this new program.
- **Aligning initiatives:** Stakeholders expressed concerns over the number of competing initiatives around public reporting, including the Centers for Medicare & Medicaid Services' Physician Compare website. Community leaders felt that moving ahead with public reporting without ensuring that they were not merely duplicating what was already available would result in simply "adding to the noise" rather than providing useful information.
- **Legal and contractual issues:** Many of the organizations involved in the Central Indiana *Aligning Forces* project were operating under contracts that expressly prohibited the public reporting of quality data at the level of the individual physician. Overcoming this barrier would have required renegotiation of these contracts. This problem was compounded by rapid personnel turnover in the organizations. Although the Central Indiana *Aligning Forces* participants

initially thought and represented that they could meet the *Aligning Forces* initiative time line, they ultimately could not. Those leaders noted that they simply did not have sufficient time to build the trusting relationships with new personnel that were necessary for these negotiations.

- **Consumer perspectives:** Although all of the other 16 *Aligning Forces* communities were already publicly presenting quality metrics, Central Indiana remained very concerned about how the public reporting of their local quality data would be presented to their consumers. Specifically, the stakeholders wanted more time to understand what types of information consumers were interested in and the format that would be most useful. The Central Indiana team perceived a risk of producing information “like the health plan report cards” and was not moved by the public reporting experience of the other 16 *Aligning Forces* communities, showing that consumer input could be used in a meaningful way within the time lines of the initiative.

In addition, there were serious technical and methodological challenges related to the Central Indiana public reporting. In spite of this daunting list of challenges, in reality, most, if not all, of the difficulties noted above would be faced by any community attempting to create public reporting of quality data at the small group level. It is worth noting that of all the *Aligning Forces* communities, including those that were also funded late in the process, only Central Indiana failed to reach its milestones toward public reporting. This was particularly surprising given the history of collaboration, robust health information exchange, and the project team’s own expectations that they could rely on the exchange as a source of data for publicly reported quality measures. Central Indiana was also the only *Aligning Forces* community relying on an HIE for public reporting of quality measures. It appears, though, that this history and resource may have been the project’s greatest obstacle. While the IHIE offered a solid base to build upon, it may have created a culture that was not conducive to the type of rapid improvement efforts required by *Aligning Forces*. Communities starting at the ground level with data exchange may have much more flexibility and could potentially structure the exchange to meet the exact needs of their current projects and goals. Starting with the right set of expectations and structures makes achieving public reporting easier than the challenge of Central Indiana, which required leaders there to change the culture of a standing organization. While such culture change is not impossible, and the community expressed the will to produce publicly reported quality data at some point, it appears that Central Indiana underestimated the energy and effort required to affect this kind of change.

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Chapter 3: “The Next Steps Are Always Easier Once You’ve Started”

An Interview by Michael W. Painter, JD, MD, Robert Wood Johnson Foundation, With **David Blumenthal, MD, MPP,** immediate past national coordinator of the Office of the National Coordinator for Health Information Technology

President George W. Bush originally established the Office of the National Coordinator for Health Information Technology (ONC) in May 2004 by executive order. At that time he also named Dr. David Brailer as the first national coordinator for health information technology.

In 2009, the American Reinvestment and Recovery Act (ARRA) established the Office of the National Coordinator as a statutorily mandated agency in the U.S. Department of Health and Human Services (HHS). In June 2009, President Obama nominated David Blumenthal to lead this effort. Dr. Blumenthal is an internist and prior to this ONC role, was director of the Institute for Health Policy at Massachusetts General Hospital/Partners HealthCare System in Boston. He is also the Samuel O. Thier Professor of Medicine and Professor of Health Care Policy at Harvard Medical School.

While at the Institute for Health Policy, Dr. Blumenthal, with support from the Robert Wood Johnson Foundation (RWJF), led the development of several previous editions of this RWJF HIT Adoption Report from 2006 through 2008. Dr. Blumenthal stepped down from his role as national coordinator in early 2011. In fall 2011, he talked with Dr. Michael Painter, senior program officer at RWJF, about a wide range of health information and health care improvement issues. These included his role as national coordinator, the pace of HIT adoption, public reporting of quality measures, and frustrations with the enormous difficulties around health information exchange.

Painter: Dr. Brailer was the first national coordinator in the ONC established by executive order, but you were the first ONC national coordinator of the new agency established under the ARRA Health Information Technology for Economic and Clinical Health (HITECH) Act. Now that it has been well over six months since you left that role, reflect on your experience as first coordinator of this new agency—your hopes, goals, challenges and disappointments?

Blumenthal: For me this was a terrific personal experience. It was an extraordinarily challenging role. It was an opportunity to really stretch myself and do work I thought was important. I felt very grateful and privileged to be at that particular spot at that particular time. I didn’t realize until well into my tenure at ONC how many fortunate circumstances lined up to make my job easier. That’s not to say it was easy, and the stakes were high. (But) it could have been much more difficult to make things work out, so I was fortunate in many ways.

First, adoption of health information technology was a presidential priority.

Second, my role was a newly created one; though, as you note, it had pre-existed as an executive appointment. The fact that ONC is now an office created in law gave it additional standing and a kind of sanction that it hadn’t had before. Importantly, it had resources, so in addition to authority, there were substantial

new resources. There was also an understanding about the very size of the mandate and the task. I think out of appreciation of the size of the challenge, many gave my office a fair amount of opportunity to set the agenda. I think it was seen by many as an enormous technical challenge. That led them to step back and give the office some freedom to create a path forward. It is an enormous task, but, interestingly, it isn't principally a technical task.

My excitement about the role was always related to its relationship to health reform. We tried to make the work of ONC a down payment on health reform, which is how the president described it. As the debate about health reform heated up and focused on the Affordable Care Act, that debate attracted attention away from us at ONC, which turned out to be a godsend. That meant that a lot of the partisan discussion that might have been focused on us—if health reform had not been so much of a lightning rod—focused elsewhere. We had more freedom and space to do our job than we might have had.

I think for all those reasons it was a very fortunate time. I don't know that there are many times in government when someone has the opportunity to come in and play a role starting something big, new, and important with bipartisan support and a fair amount of autonomy. That was my experience, though. I think my goal always was to make a good start. I never thought that during my tenure we would get anywhere near completing the job. My goal was to get a good start, to get us on the right trajectory, or at least a trajectory that was as good as we could do under the circumstances.

It was also important for us to create legitimacy for the ONC so that there would be respect and deference to ONC work. We needed enough legitimacy so that we were not always surrounded by controversy and opposition.

On both those scores, with an enormous amount of help from a great team at ONC, we were successful. The question now is whether we will be successful across the nation with actual adoption and use. We will see if the regulations that the Centers for Medicare & Medicaid Services (CMS) put forward with our advice, and the other regulations that we develop and the grant programs we put in place, come together to change the way care is delivered. It is going to be some years before we have the answers to those questions, but some of the preliminary data released recently by the HHS on rates of adoption of basic EHRs are encouraging

Painter: Any disappointments?

Blumenthal: I wish we could have made more progress on health information exchange. I don't think we could have, but I *wish* we could have. We consciously saw that as a next step, not the first step we needed to undertake, but a subsequent step. As I liked to say at the time, we felt we had to operate before we could inter-operate, and when 80 percent of physicians and 90 percent of hospitals have no information in digital form to speak of, making it a priority to exchange that information didn't make a lot of sense. There were other reasons as well that made it hard for us even to demonstrate exchange at work.

I did not fully appreciate how difficult that work would be. I don't think I fully appreciated the nature of the task. I do think it is an area of shortcoming for my leadership and for the office. I by no means, though, think it is a lost cause. I still think we were right in setting out meaningful use as the first priority. There will

be lots of opportunity to make progress with information exchange. Make no mistake, though, it is going to be a huge and difficult social project. I am just now getting my arms around it conceptually and from a policy standpoint.

Painter: That's fascinating. Let's follow this point about information exchange. As you say, exchange is very important. This edition of the report includes a case study about a prominent health information exchange [HIE], the Indiana Health Information Exchange, that previously was a participant in the Robert Wood Johnson Foundation long-standing regional improvement effort, *Aligning Forces for Quality: The Regional Market Project*. That HIE, however, ran into barriers that made it essentially impossible for the people of Indianapolis to use their HIT data resources for publicly available performance health care measurement information.

Given how important health information exchange resources could be to improving publicly available quality information, that failure seems like a huge loss for Indiana and potentially ominous point for national health care improvement.

Could you comment more on HIEs, their potential role in helping to improve the quality of health care, as well as these barriers to that potential that we are starting to see?

Blumenthal: The exchange of information is going to be one of the most ambitious health care social projects that we ever undertake. The mapping of the human genome will look simple in comparison. The reason is that it's a humanware problem, not a software problem.

Health information exchange is a team sport. Using a football analogy, you can be Tom Brady or Peyton Manning, but if you don't have a receiver down the field, you might as well not show up. The same is true for health information exchange. If, for example, [a health care system, such as Intermountain or a health care plan, such as] Giesinger, says, "Hey everybody, I can exchange information. We've got the systems all set up. Our vendor says they are interoperable with everybody. I've got all my standards in place. We've got middleware all set. Send the information and we'll send it back." And everyone says, "What do you mean? We have no interest in that. We can't do it, and we are not going to do it." Well, what good is that Intermountain capability?

You can do technology adoption by itself as an individual organization or an individual provider. But with information exchange, you, by definition, must build that capability in collaboration with others. Right now, the case for collaboration is marginal at best. In fact, sometimes the case is actually negative. It costs money to do, and no one pays for it. No one benefits from it except the patient and the payer, and they are not at the table providing extra funding. Payers feel like they are already paying plenty, and they are. In our system, though, they are not paying for information exchange.

We have to solve the social, economic and cultural problems related to building health information exchange. We have to overcome what I call the Toyota/BMW effect in local markets. It is not a natural act to expect BMW and Toyota to do a data dump from their client populations into their competitors' computer systems. It is not a natural act to expect Children's Hospital Boston

to do a download of its data into other Boston area hospitals' computers. They are competitors; they are not allies. They are fighting for the same patient population; they are fighting for reputational value. Therefore, solving the technical problems around exchange will clearly not solve the actual problems of developing information exchange.

In fact, it's even worse, since the technical software and the adaptive humanware problems are interactive. You will never get the software right until you actually try to make it work, and you will never try to make it work until the incentives are there.

If there is no will, there is no way. Many implementations, false starts and adjustments are going to be required in every exchange environment. You are going to have to devote resources to it and personnel. CEOs are going to have to get reports on it; they are going to have to hold CIOs accountable for it. They are going to have to come together with other CEOs, and say that they agree to make this happen. Individual doctors who belong to Orthopedic Group A are going to have to agree to exchange information with their arch rivals Orthopedic Group B. All those things are going to have to happen. Ultimately, though, until we get incentives right for care coordination, I don't see those things happening.

Now you were asking about quality reporting; well, quality reporting is a great potential product of data exchange, but it won't happen until the data is flowing. The first thing patients and consumers want, actually the first three things they want, are: data about themselves, about their individual personal health circumstances, [and for it] to be available at the point when they get care. That is where we are going to devote our health care resources to start. The way the public is going to want this to happen is for their doctors to know about what other doctors are doing. Once we get that in place, then I think we can start to turn to these valuable secondary uses like: public reporting measures, biosurveillance, recruitment to clinical trials, post-marketing, surveillance for drugs and devices, and all the other things we imagine and hope will be forthcoming.

Painter: That is pretty bleak.

Blumenthal: No, I think it is realistic. I think that until we get realistic about it, we are not going to confront the problem. People who are naïve to the social circumstances look at the technology and ask the IT [information technology] people, "Did you just fall off the turnip truck? You mean you can't get these two computers sitting next to each other to talk to each other? What is wrong with you?"

The answer is that getting the computers to talk is only a part of the problem. Sure, it needs to be worked out, but we need to focus on the incentives and the structures for care coordination in communities before we can expect the technology to work for us.

Painter: You describe public reporting of information as a secondary use. Some argue, though, that an important actual meaningful use of HIT is the use of the technology to make health information available to health professionals and the public to assist in decision-making and, importantly, to support the payment changes you just said were necessary for information exchange to develop. Many believe that HIT-enhanced measurement will be critical for improving care, quality and cost and the payment reforms that support those

changes. Do you agree with that premise? It sounds like you may not, but could you explain how the current HIT adoption meaningful use policies get us to an enhanced state of information transparency?

Blumenthal: Well, it is possible for the federal government to single out some uses and say, even if you won't share that with the guy down the street, you have to share that with us. That is what meaningful use does. It is essentially saying you must report quality measures to us the way you report to Medicare and Medicaid. Then those data become accessible for reporting purposes. That is a somewhat different issue than health information exchange. It is an exchange of information, but it is not exchange on a local level for care purposes. It doesn't produce the robust databases that I think are possible to create if you've got local exchange going on and real opportunity to do innovative and new queries of those data. What we can do through the meaningful use rule and other pay-for-performance requirements is specify certain kinds of data will be reported by electronic health records in return for particular incentives.

Painter: So that means for the public reporting mechanism, you think we are on a trajectory, without HIEs, to make progress on HIT-enabled public reporting; is that right?

Blumenthal: Yes, it's just not through exchange as I have heard it described. When you talk about exchange with lawmakers or other policy-makers, they think about health information exchange in terms of finding information needed to care for the unconscious patient in the emergency department: searching all the local databases around town or even further out geographically. They talk about not filling out those clipboards in the doctors offices anymore. They talk about making sure that you don't repeat the MRIs that were done down the street. They don't generally talk about quality reporting. They are much more focused on what the average person thinks is important to them and their family. The average person wants the benefit of exchange, but they don't think of it as experts like the Robert Wood Johnson Foundation do or think about it in terms of the dynamic of the health care system.

Painter: Let's go back to the point you made that most initially thought the work of adopting health information technology, not just building exchanges, was mostly a technical challenge. You note that you've realized it wasn't even principally a technical challenge but rather, mostly, a cultural and adaptive challenge. Is that right?

Blumenthal: My major concern before taking on the national coordinator role when I talked to some of my mentors and friends about whether I should take the job was that I didn't know anything about IT from a technical standpoint. They, being wiser than I, said, "That's your strength. That's why you are a good person to play this role."

I think that was actually true. There were at least two things that were helpful. One, I had practiced medicine with an electronic health record, so I knew what went through the mind of a physician when he started using one. I could put myself right in the practice at the time it was introduced and follow in my own mind how their work would be affected. I realized it was ultimately the choice of providers to adopt or not to adopt, and we had to find a way to make them want to do it.

I also understood the health care system and the organization of care. I understood hospitals since I've been a hospital executive. I had a perspective on what motivates physician behavior, what motivates buyer behavior and how and why change generally doesn't occur in the health care system. I felt that I was prepared to see this as a change management problem, as a psychological, cultural, economic, societal issue rather than a technical project. I think that ended up being much more important to understand than the technology.

Painter: Before you became the national coordinator you were a leading voice and researcher establishing a national gold standard approach to the measurement of national HIT adoption and the barriers related to that adoption. Because of that experience, you are very knowledgeable about the pre-HITECH low national rates of adoption and the challenges to adoption.

Are you satisfied that post-HITECH, the nation will get where it needs to be with adoption? We're just talking about adoption now. Are we on the right trajectory or should something else happen? What worries you?

Blumenthal: First, based on my knowledge of the policy problem of IT adoption and meaningful use, I think the HITECH Act was extremely well designed. That is, the law that we are implementing was well designed. It attacked head-on the problems that research showed were inhibiting the adoption of electronic health records. I don't think, though, that our research had addressed exchange that clearly.

I think we had good tools. I think we implemented those tools quickly and in a way that the field was willing to try and work with us. By those criteria, which are pretty basic criteria, I think we started out on the right trajectory. We got technical assistance and training programs out there. We got states mobilized to be involved with health information technology, and we started the Beacon Community Program, [which provided funds to 17 U.S. communities that have made headway in implementing EHR.]

We've created a sense of motion. Because we tried very consciously to be open about it and to listen, I think the meaningful use regulation was both ambitious but obtainable, or so I hope. Time will tell whether we were successful.

The data on adoption and meaningful use at this point can be read in both a positive and a not-so-positive way. Rates of registration for meaningful use are as high as I would have expected, more than 114,000 providers. On the other hand, the numbers of people who actually have attested to obtaining meaningful use are relatively small. Lots of primary care physicians have registered with our regional extension centers (RECs). I think ONC has attained its target of registering 100,000 providers. Most encouraging, 2011 data from the National Center for Health Statistics [NCHS] shows a sharp jump in the proportion of physicians with basic electronic health records. The percentage increased from 20 percent in 2009 to 34 percent in 2011, and among primary care physicians, from 22 percent to 39 percent. You know, by some standards, that is a pretty good number given the American public's general view of government. Ultimately, in two or three or four years, we will look back and say we changed the information flow in health care or we didn't. I actually suspect that it may be 10 or 15 years before we can fully address the impact, and all we could have hoped for really, in the first few years, was to change the slope of the adoption curve. That may already be happening, judging from the 2011 numbers.

Painter: This interview is part of the 2012 HIT adoption report, which includes an analysis of that very important 2011 adoption and use data. RWJF has produced a version of this report since 2006 in collaboration with ONC. You led the development of this report for several years before becoming the national coordinator. That means you have a unique vantage point about the usefulness of independent reports like this one.

Could you talk about the importance of an independent report of this nature monitoring and reporting on something like the ONC work and activities?

Blumenthal: Absolutely. Independent, objective and trustworthy information on levels of change and the reasons for change or the lack of change are very important in government. They are especially important in highly politicized climates and highly politicized organizations. I don't know and can't speak to the thinking in the administration that preceded us, but I'd like to think that the office, when I was there, was willing to release information that was not necessarily flattering.

I don't think you can count on that in every time period and for every administration, though. I think it is important that other groups, knowledgeable, sophisticated groups, review the data and come to their own judgments.

I think you, the Robert Wood Johnson Foundation and my predecessors at the Office of National Coordinator, made a great contribution by setting that agenda, setting that activity in motion and now creating the expectation that objective information would continue to be forthcoming. The way the data collection has been structured makes it very much more likely that objective information will continue to be available.

That is why my predecessors delegated that data collection to independent entities, one within the federal government—the NCHS—and the other, the American Hospital Association [AHA], part of a trade group. Given its trade group affiliation, the AHA is not necessarily totally objective, but NCHS is very protective of its methods and its data.

The AHA has a pretty standard survey, but it does have some influence on which questions are included. There was some controversy about some of the questions that we included in the AHA survey, but having independent academic investigators actually produce the reports also adds a lot of credibility. I guess that is the long way of saying, “Yes, I do believe that this RWJF report plays an important role. It's great to have it institutionalized.”

Painter: You mention both AHA and NCHS surveys that we all use now as essentially the gold standard to assess the rate of adoption. Prior to your ONC role, you and your team had a hand in crafting that gold standard survey approach, right? Could you talk about that a little bit?

Blumenthal: We were asked by you and ONC to create survey instruments that we developed with a panel of experts. David Brailer, my predecessor, very wisely asked for the data to be developed by external experts. At the time, I didn't realize how complicated it was to do these types of reports as part of government. I think this report had a lot of credibility. Pieces of these reports also were published in good journals and that added to its credibility.

We created the survey instruments. Then with ONC and your help, we handed them off to organizations that had the resources and the ability to continue to administer them as a part of other ongoing surveys. That meant that the respondent burden would be lower and the response rates higher. When I was at ONC, we did create an Office of Economic Analysis and Modeling that developed some additional surveys. I am hopeful these new ONC surveys will be valuable, but I doubt that they will be ongoing because they are not part of institutionalized surveys.

Painter: You said that one of your strengths in the national coordinator role was your vantage point as a physician. Could you put yourself into the shoes of a physician in a small clinic and help us understand why, in spite of the generous HITECH incentives for adoption, such a doctor might decide to wait rather than adopt now? Such a physician might argue that he is not convinced that these incentives will cover the real expense of the adoption. That doctor might worry that he will invest in a system that will become obsolete quickly and that he would need to make another large technology investment soon. How do you convince those that are still waiting to adopt now?

Blumenthal: The first thing such a doctor needs to realize is that he is never going to get help like that available now from the federal government again. That bank is exhausted. The almost \$30 billion projected to be spent, assuming that people take advantage of the incentives, amounts to \$100 for every man, woman and child in the United States. That is an extraordinary investment by this country in helping doctors adopt a new technology. There is probably not another thing that those doctors will ever do in their lives where everyone walking on the streets in the United States will be paying \$100 to help them. If they want to pass that up, that is their right. I don't think it is a very wise decision.

It is true that whatever they buy will become outdated just as their iPhones and PCs do. The next step, though, is always a little easier if you've taken the step before it. It's a matter of getting started, and there is never going to be a perfect time to get started. There is always going to be a reason to wait because whatever you adopt now has the potential to become obsolete. I don't think that is a real reason not to do it. I think those arguments instead are arguments not to change. We recognized that and worked to make it as easy as possible for physicians to make this change. Some won't go forward and that is their choice. They may be happy not to get the incentive or to pay the penalty. I do think we will get to a tipping point where robust adoption and use will be the mode of practice within the next five to seven years. At that point, I think some of these arguments will drift away.

Painter: What about examples like Practice Fusion and other similar solutions where companies have innovated around this adoption pain point of cost? By that, I mean moving the electronic health record essentially into the Cloud. Those companies can then make the application essentially free for a small clinic and instead, innovate on the income stream. What do you think about that sort of disruptive innovation in this space?

Blumenthal: That's great. That is what we hope to accomplish. There are now over 1,300 certified electronic health records and modules. Most of these are products of really small companies. You've got this totally transformed market for this technology. One of the ways they are going to compete for the new products is on their usability. That is great. Another competition point will be on price, and that is also great. This is one area where I expect price will come down dramatically

over time especially for small practices and especially for parts of the market where the stakes are lower. For example, a practice could rent or lease a record system and wouldn't have to buy it and install it. Therefore, that practice isn't quite married to a particular technology. I don't know the Practice Fusion example in particular. I do worry that some of the smaller companies may not have longevity. The big issue becomes how to get information out of one Cloud and into the Cloud next door without any thunder or lightning.

Painter: Good metaphor.

Blumenthal: That was something that we were taking up with the industry when I left. I don't think we've solved that problem yet. I think it is the next issue down the line. It's an issue for big systems as well as small systems. It probably would be easier when it is Cloud-based than when it is stuck on a server in Boston somewhere that needs to be changed from time to time—which requires that the server be ripped out and replaced.

Painter: Let's talk some about the RECs [regional extension centers]. They are one way to help professionals adopt. Could you talk about the strengths and the weaknesses of the RECs?

Blumenthal: It may be too early to be definitive about that. I am very pleased with the rate of enrollment as I mentioned before. There are some RECs that have met their targets within six or eight months. Now the question is going to be whether they get a substantial number of providers to meaningful use. I don't know how that is going, to be frank. I haven't chatted with folks at ONC about that in three or four months, so I don't know how they feel they are doing and a lot of the regional extension centers may not know precisely how they are doing yet. But as a new government program, it got going fast, it met all its targets, and it has clear goals and accountability. RECs have a good information system that is very effective in tracking enrollment and the status of clients. I think they're off to a good start. The question is whether physicians find this particular source of support to be added value. That will be the point at which we will be able to call the RECs successful or not.

Painter: It sounds like the ultimate test here for REC success is whether they get health professionals to meaningful use. We won't know that for a while.

Blumenthal: I think that's true; that's how we defined it. They met their enrollment goals. We set out to enroll a certain number of primary care physicians, and I think there are about 120,000 over about a 16- or 18-month period. You couldn't help them unless they raised their hand and said "Please help." That was the first step. Then the question is going to be, do people who have an REC use that resource help to get to meaningful use? We won't know that definitively for some time. It may be that the high registration numbers to some degree reflect REC influence. We just don't know yet.

Painter: It is admittedly hard to draw from international comparisons or to understand exactly what the implications of another country's experience might be on our own. In August, though, reports appeared in the media that U.K. officials will abandon a large expensive effort to build their national electronic health record network in spite of the billions of pounds already invested. That could seem like potentially really ominous news. Are there lessons that we should be drawing from that and what are we doing differently to avoid that result?

Blumenthal: The program that Congress developed is completely different in theory and practice from the U.K. program. The tasks that the U.K. program set were different. The U.K. program was structured as a procurement effort. It's a little like the U.S. Department of Defense saying "I need a new fighter jet. Let's put it out to bid and then pick a competitor or several competitors. We will have them deliver the technology a year and a half from now or five years from now at a given projected cost." That is a centralized purchasing model.

At least for the United States there was never any hope or desire to proceed on that model with HIT adoption. Congress and the administration perceived our effort as a bottom-up process. The goal was not to procure technology, but rather to change the incentives facing decision-makers in the field at the grass roots for the acquisition of the technology. In the United States effort, it's not the government that is acquiring the technology. Instead, it will be hundreds of thousands of individual physicians and thousands of hospitals. We also didn't try to pick a particular technology for a region the way the U.K. did. We consciously left open and encouraged the market to proliferate choices. That way the individual user, the customer, would have a range of choices that they could make to pick the one that was best for their purposes. We would also build in some market protections in the form of certification programs that provide information about the quality of a given technology.

That bottom-up kind of incentive-based, market-oriented individualized process is probably the only way to promote HIT adoption in this country, given the fact that there is no governmental control over the provision of service. It may also, of course, simply be the best way to procure this kind of technology in Western democracies.

Painter: That was my next question.

Blumenthal: Most other countries have not gone the route of the U.K. trying to build a network from the top down. I think the U.K. was something of an anomaly. Of course, the flip side danger of the approach we take is that you can't control it. The upside is that once people make decisions that are right for them, you will get a solution that is more accepted and useful.

Now the counterpoint example in the United States is the Department of Veterans Affairs [VA]. I don't think that example applies here, though. Instead, I think of the VA not as the government, but rather, as a large user of the technology. The VA has developed their own tool for their own purposes. I would classify Kaiser the same way, actually. There are big quasi-monolithic organizations and you can point to big health systems, you know, Ascension, Intermountain, Giesinger, or Partners or whoever, and they will make the decisions to fit out their systems perhaps with one of the solutions. They are, though, acting as a market entity in a health care system. They are not trying to make decisions for organizations they do not control for circumstances they don't know.

There are big health care providers and there are Mom & Pop individual providers. They have different needs, and they should be making those choices themselves. The government doesn't try to tell a rural family practitioner how many exam rooms to have, whether to put the examination table on the left side or the right side of the office, which phone service to get, whether to use Quest or LabCorp, or whether to use a closed MRI or freestanding MRI. We don't try to dictate practice decisions, and this electronic health system is part of a practice.

Painter: Let's talk about meaningful use. The HITECH act introduced the new statutory concept which prompted the regulatory definition that triggered Centers for Medicare & Medicaid Services (CMS) incentives to support HIT adoption and use. Meaningful use is meaningful if it triggers payment. There is, however, arguably, an understanding of meaningful use that is broader than the regulatory definition necessary for the payments of the incentives. By that, I mean the actual use of technology to promote improved and efficient care. Do you believe that the regulatory meaningful use rules really help us understand and move toward the actual, truly meaningful use of health information technology?

Blumenthal: Yes, I believe that the regulatory first stage of meaningful use does, and I hope that subsequent stages will. The design of that first regulation was meant to meet the health system where it is. Places like Intermountain, Giesinger, Palo Alto [Calif.] Medical Center Group with advanced IT systems said, and some health plans made the same point, that the first stage of meaningful use is too timid, just a baby step. They said that we were playing to the lowest common denominator. Well, perhaps, but I will tell you that the lowest common denominator thought we were crazily ambitious. Our goal was to stretch, but not break providers. We clearly are stretching them.

There are parts of my own system, Partners HealthCare, that are going to have trouble getting to meaningful use in stage one. In almost every system, there is something that has stretched them. It may be the quality metrics. It may be the sharing of patient records. It may be CPOE [computerized physician order entry] but it is sufficiently ambitious. I do worry that many providers will be scared off by it. The first stage, though, is not a ceiling; instead, it's a first hurdle. If you think of it as a high jump, we put the bar at 4.5 feet. If you can jump seven feet, there is no reason you can't go right ahead and start at seven. We think that elements in that first rule are on the path toward jumping seven feet. By that, I mean, you must have jumped the 4.5 feet at some point in your training before you can do seven feet. Some don't agree that we should be rewarding all those training steps, of course. For example, there are a very few places, Intermountain is one, that really don't believe the CPOE part of the meaningful use requirements is necessary. They just think there is another way of organizing the record. Frankly, I don't believe there is literature on that. In fact, if there is any literature on the value of HIT, it's all about CPOE. For us not to include CPOE as a sort of basic step would have been contrary to all the empirical evidence. In any event, the bottom line is that we have a big complicated country. We tried to find a sweet spot with meaningful use. Time will tell if we did.

Painter: Thanks so much, Dr. Blumenthal. Thank you for your candid thoughts here, and more importantly, for your years of work on this important goal of advancing the adoption and use of health information technology in the United States. We all greatly appreciate your service to the country.

Chapter 4: Enabling Meaningful Delivery System Reform Through Health Information Technology and Promising New Health Care Models

Asaf Bitton, MD, MPH, Brigham and Women's Hospital; **Lydia A. Flier, BS**, Brigham and Women's Hospital; and **Ashish K. Jha, MD, MPH**, Harvard School of Public Health

Introduction

The United States faces enormous challenges in reforming its health care delivery system, which too often produces suboptimal quality at substantial costs. In recent decades, health information technology (HIT) was frequently viewed as a sort of alchemy: there was an existing belief that the right equation of electronic tools and supports might be the secret ingredient to transforming our fragmented health care system into one that delivers high-quality, cost-effective care. Over the last several years, multiple studies have called this approach into question, leading some policy-makers to worry that HIT will not have a substantial impact on health care delivery reform. It has become increasingly clear that while simply installing electronic health records (EHRs) in every practice and hospital will have limited initial benefit, HIT is nonetheless an essential foundation for any broader effort to fix our ailing health care system. Beyond developing and installing EHR systems, ensuring they promote integration and interoperability will be key to maximizing their benefits.

Two of today's biggest focal points in health reform will depend on HIT innovation, integration, and scaling up: accountable care organizations (ACOs) and patient-centered medical homes (PCMHs). The development of these models is still in process, and particularly for ACOs, it is not at all clear what the final model will look like or how it will function. Moreover, there is likely to be substantial variation in how these models are implemented across the country. What is clear is that neither of these efforts is likely to be successful without the broad-based use of EHRs and robust health information exchange (HIE).

In this chapter, we describe in broad strokes the current thinking around each of these delivery models and why HIT is necessary to their success. We also explain the government's "meaningful use" financial incentives, describe their effect on relevant HIT development, and describe the possibility for unintended consequences. We also discuss why improvements to the current technologies are necessary, as well as various supports and roadblocks to developing and adopting the correct tools. Lastly, we mention up-and-coming HIT tools and domains that may begin to define the future of care delivery via these models.

The Accountable Care Organization

ACOs are intended to restructure health care by linking health care provider teams, resources, and payment risk under umbrella organizations that manage patients through the continuum of care. They have the ability to accept risk for the cost and quality outcomes of a defined patient population.¹ In attempting to fundamentally restructure health care in the United States toward higher value, they theoretically have the potential to reduce (or at least limit) soaring cost increases. ACOs are most often proposed under the rubric of Medicare shared savings programs involving varying arrays of provider trend management and cost containment risk, often with retrospective patient assignment. A prospective ACO structure—the Pioneer ACO model—will be adopted in 2012 with 32 health care systems enrolled in a Medicare demonstration project. Although ACOs are in their infancy, in many ways they are an attempt to mimic integrated delivery systems like Kaiser with an overlay of payment change. The ACO model prescribes quality measurement and continuous improvement strategies that have been the hallmark of high-performing systems across the United States for decades.²

Structurally, ACOs can be formed through fully integrated networks, or more “virtual” networks of providers who share data and risk, but not full organizational hierarchy.³ They can include hospitals but they need not. In the current model, ACOs usually require a large group of ambulatory providers—primary care physicians or specialists—to work together to effectively manage care. Ideally, a strong backbone of highly effective primary care practices would coordinate services with specialists through the continuum of care to generate financial savings.

The potential advantages of the ACO model include the fact that it harnesses existing referral patterns, does not force providers to physically and financially integrate, and allows for coordination among providers who are already often working together. For patients, they offer the potential to receive more coordinated, high-quality care, without impeding their freedom to switch providers. This mandated provision, though, means that ACOs will have to manage “leakage”—when patients go outside the ACO to receive care that the entity is responsible for but unable to influence. Because patients are not choosing the ACO, they can receive care in any setting by any provider who accepts Medicare. Policy-makers have been very clear that providers should not restrict the ability of Medicare fee-for-service beneficiaries to receive care wherever they want. Thus, in the absence of aligned payment incentives and interlinked records, providers need to find creative ways to manage leakage and ensure coordinated care.

The Patient-Centered Medical Home

The patient-centered medical home (PCMH) is a model intended to alter primary care delivery. (Comparatively, ACOs can be thought of as integrated “medical neighborhoods.”⁴) The current approach to primary care is insufficient and unsustainable: physicians are often too rushed to treat complex, chronically ill patients comprehensively as individuals, and do not have the practice support to focus on the health of the population of patients for whom they are responsible. This leads to both provider dissatisfaction and suboptimal primary care. PCMH models seek to address these deficiencies by employing integrated care teams and interlinked messaging systems to make better use of provider time and give

patients comprehensive care within and outside of the clinic's walls. Ideal PCMH care is proactive and continuous throughout the patient's life; emphasizes team follow-up after tests, consultations and hospitalizations; is applied to the entire panel, not just the day's patients; and is regularly measured to improve quality. By both expert consensus and national recognition requirements, HIT is central to many of the core PCMH domains, including test and referral tracking, quality measurement and feedback, clinical decision support, and disease registries.^{5, 8}

Meaningful Use and Its Potential Role in Delivery Reform

Financial incentives exist for providers to meet HIT requirements as defined by the government. Funding from 2009's Health Information Technology for Economic and Clinical Health Act (HITECH) supports certain "meaningful use" guidelines for EHRs—specifically, HIE, electronic prescribing, and automatic quality reporting.⁹ Easing up on the requirements, the Centers for Medicare & Medicaid Services (CMS) final rule on ACOs no longer requires that over half of participating physicians meet MU requirements. It does, however, require the use of the EHR to be considered an ACO, emphasizing that tool's importance to clinical decision support and successful data integration.¹⁰ Importantly, the EHR stage 1 MU requirements overlap with the ACO quality measures by at least 58 percent, emphasizing their mutual interconnectedness.¹¹ However, the MU criteria still creates two sets of challenges to the broader goals of promoting more effective primary care through PCMH and ACO.

First, it is unclear whether the criteria for MU align with the most *effective* HIT use—that is, the kind of HIT that will drive more integrated, safe, and efficient delivery of health care. Policy-makers could help improve this "alignment" problem by explicitly focusing on HIT functions that support development and effective implementation of PCMHs and ACOs, requiring those functions be available as part of the EHR certification criteria and other regulations and incentives.¹² For example, by explicitly requiring registries or other technologies that can facilitate population management and teamwork, federal policy-makers can encourage the use of HIT to promote PCMHs.

A second issue with the current approach to MU is the time line. While federal policy-makers try to use MU incentives to encourage EHR adoption, the short time line may be difficult for many providers to meet, especially given the slow nature of thorough HIT adoption. Indeed, many HIT necessities—such as patient registries that sync with EHR or telehealth technologies for out-of-office doctor-patient interaction and patient monitoring—either do not yet exist or are not scalable to meet national needs.⁵ HIT is both fundamentally important to the success of reform and potentially, its Achille's heel. In this paper, we lay out a road map of challenges and potential solutions for better utilizing HIT in PCMH- and ACO-centered health care system reform.

ACOs and Why They Require HIT

A key underlying assumption of the ACO model is that providers will have to work together, share data, identify high-risk patients, employ care coordination and other strategies to manage costs and quality, avoid duplicate or otherwise unnecessary services, and measure results. In doing so, ACOs will lean heavily on HIT infrastructure in the domains we outline below; but like HIT in the PCMH, the reality of current EHR capacities does not always meet the needs of developing ACOs. When there is robust deployment of EHRs with HIE, providers will be able to execute the fundamental features to receive shared savings.^{4, 14, 15} Seamless sharing of data among providers, care coordination, patient risk segmentation, quality measurement, and cost tracking all rely on high end use of current HIT systems. But with few hospitals using fully functional EHRs (around 9.0% in 2011) and just an additional 10 percent using even a basic EHR, it is unclear how ACO-level HIT functionality will be quickly achieved, even with dual HITECH Act and CMS shared savings program incentives. This “moat” of non-existent HIT functionality threatens to cut off widespread adoption of the ACO model at its infancy, limiting it to a few already high-performing systems. But even these high-performing users may not have suitable HIT functionality; recent work suggests that even most Healthcare Information and Management Systems Society (HIMSS) stage 7 hospitals (which likely account for only the top 2.0% of hospitals in terms of their EHR capabilities) may not be fully ready, from a HIT perspective, to function as an ACO.¹⁶

HIT, Provider Integration, and Payment Risk in the ACO

Durable linkages between disparate providers in an ACO will require improved data sharing and interoperability, and will need to address long-standing organization challenges around provider and physician-hospital integration. Concerns abound about CMS Proposed Rules on ACOs that allow ACO patients the ability to opt out of an ACO at any time to get care elsewhere.¹⁷ While this provision is critical to ensuring patient choice while still pursuing greater integration, it will increase the difficulties providers face in tracking outcomes across the population. While a number of possible solutions have been suggested, none of these fully address the enormity of the “leakage” challenge for participating providers given current lack of a national HIE system. Providers may be hesitant to take the risk of being fully responsible for a patient whose care they cannot easily track outside their own ACO.

ACO-supporting HIT requires an EHR with advanced data standard support and connectivity which are rarely found in commercial EHR systems.¹⁶ As ACOs evolve, they will require greater connectivity among interlinked providers, and the capacity for advanced data analytics and predictive modeling technology to support population risk segmentation. Furthermore, these analytics are needed to create “smart” registries to track robust disease, care, and utilization management applications across the care continuum in order to meet shared savings targets.¹⁶ Transformed, team-based, IT-enabled primary care practices with developed EHR infrastructure must form a key base of this model if it is to succeed.

Segmentation will be a key element of success for ACOs: between 5 percent and 15 percent of a given population drives 60 percent to 70 percent of total costs. Knowing who these patients are, and where and how they receive care is critical to effectively manage them through the deployment of resources like care managers and home-based services. Most segmentation models exist separately from EHR systems and are often expensive and proprietary commercial applications. Less expensive versions of these software tools have been developed in academic settings, but few can be deployed by the marketplace at this point. EHRs will play a central role in helping to identify and manage these high-cost patients.

A critical need also exists for semantic interoperability to identify the key early data elements required for data sharing, reporting, and analysis. While the MU and interoperability standards are being developed, a possible temporizing solution may be found in natural language processing, which one commentator has defined as a way “to take blobs of data and turn them into something”,¹⁸ Murff et al. (2011) examined a series of natural language processing algorithms within the VA hospital system, finding that they were reasonably sensitive and highly specific for the detection of important common postoperative complications.¹⁹ The rapid integration of this technology into HIT for an ACO offers great promise for other applications, such as automated quality assessment and care process gap assessments.²⁰

Ensuring Adequate Health Information Exchange for ACO Success

Ideally, ACO-connected providers would view HIE entities, such as regional health information organizations (RHIOs) as trusted, neutral entities to facilitate information mobility. However, recent research suggests that current RHIOs have limited capacities to serve such a function for early ACO entities; less than 3 percent of hospitals and 1 percent of practices were covered by existing RHIOs that supported stage 1 MU criteria for HIE.²¹ Clearly focused efforts to expand existing RHIOs, and enable them to support broader HIE capacities, are critical.

Current state-based efforts are working to either expand the capabilities of local entities, (in states that already have functioning health information organizations) or to establish an exchange (in states that don't have pre-existing infrastructure). However, many of these efforts are focused on allowing providers to meet MU (see chapter 2 on health information exchange). Although the details of the MU criteria for stages 2 and 3 have not yet been finalized, the HIE requirements are unlikely to be adequately robust for providers who are hoping to use health information organizations (HIOs) for clinical data exchange within an ACO. After the HIOs are established, states should focus on expanding the list of functions supported by the HIOs beyond MU to support ACO formation. While some states—likely those with a high degree of ACO participation—might choose to do this on their own, federal policy-makers may need to coax other states so that they do not fall further behind.

ACOs and the Meaningful Use Requirement

Many providers and hospitals are understandably making large capital investments to position themselves to qualify for MU incentives. A recent industry leader forecast that in 2011, hospitals will spend nearly 50 percent of their total IT capital budgets on IT applications such as EHR software, up 2 percent from 2009.²² Most of these systems do not interlink well with each other, creating islands of electronic clinical data. Given that competition is a major barrier to broad exchange of clinical data,²¹ whether MU incentives alone will drive providers to exchange clinical data is unclear. Meaningful use requirements for HIE are quite weak and it is likely that many providers will engage in just enough information exchange to receive the incentives, but not become part of a broad-based effort to share clinical data.

There are other ways in which the current efforts through HITECH will be inadequate to achieve the HIT needs of an ACO. First, it leaves many providers, including those in mental and behavioral health, out. Proposed legislation by U.S. Senator Sheldon Whitehouse (D-R.I.), the Behavioral Health Information Technology Act of 2011, aims to extend incentives for health IT to mental health and addiction treatment, and to extend Medicare/Medicaid reimbursement for MU of EHRs to clinical psychologists and social workers. Other providers not compensated under the MU program include nursing homes, rehabilitation facilities, and long-term, acute care hospitals. If those providers don't end up using HIT, it will be very hard for ACOs to track and manage care in these settings, which are among the most expensive and least well-coordinated.

Beyond achievement of basic or expanded MU reimbursements to critical providers, other fundamental HIT marketplace barriers to rapid expansion of ACO models of care exist. As Classen and Bates (2011) recently pointed out, the majority of EHR clinical innovation over the past quarter century has occurred at four well-known institutions.²³ These entities have built highly customized, idiosyncratic, integrated systems ideal for rapid quality improvement. In contrast, the commercial EHR space has been plagued with poor user responsiveness and customization, a variety of systems inadequate to the current needs of health delivery reform,⁵ and now a shift in focus to meeting MU requirements. This focus on MU, and explosion of vendors trying to meet these (lucrative) requirements, paradoxically may stunt EHR innovation at the very time when the industry most needs it. Moreover, academic innovation leaders are constrained by federal funding cutbacks and internal pressure to move toward commercial EHR applications, further threatening cutting-edge EHR development.

Why HIT Is Critical for the PCMH Model

Just as HIT implementation is critical for ACO success, patient-centered medical home transformation will require enhanced uptake of HIT. Although existing PCMH implementation models vary in exact structure, most attempt to align with the following core PCMH principles: care coordination and integration; quality measurement; increased patient access to the care team; whole-person orientation; physician or nurse practitioner-directed provider teams; a personal physician for each patient; and payment reform.²⁴ All of these, particularly the first three, depend on high-functioning HIT to get the maximum benefit, and many necessary technological supports are already present in academic discussion (see Exhibit 12).

Exhibit 12: **Patient-Centered Medical Home Adoption Dependent on HIT Functionality**

| PCMH Joint Principle | Key Hit Functions to Facilitate Its Adoption |
|--|---|
| <i>Care coordination and integration</i> : tracks patient across primary care, specialists, hospitals, patient's community, etc. | Registries: interoperable electronic health records and health information exchange |
| <i>Quality and Safety</i> : including measurement and feedback loops | Clinical decision support: HIT measurement capacity; clinical decision support; e-prescribing; registries |
| <i>Enhanced Access</i> : facilitated patient-provider interactions | Patient Portal access to personal health data with availability of the full record at, and between, visits |
| <i>Whole-Person Orientation</i> : PCMH treats all patient health needs or arranges necessary care | EHR-based care transition support (such as registries of patients at high risk for re-admission or recurrent ER use); registries for non-traditional measures such as patient-reported outcomes |
| <i>Physician-Directed Provider Team</i> | Need for seamless team messaging to let the MD manage care with team members |
| <i>Personal MD or Nurse Practitioner for Each Patient</i> : ongoing relationship | Patient portals or personal health records that allow patients to access their care between visits |
| <i>Payment Reform</i> | Patient population risk segmentation: analytics to support partial or fully capitated care |

While HIT is a bedrock of the PCMH model, simply adopting these new technologies is unlikely to be sufficient to improve primary care: it is how they are integrated into the PCMH model that holds true promise for care delivery improvement. Some studies suggest a feedback cycle: while HIT is an important basis for thriving PCMH, PCMH-like care transformation is necessary for successful HIT implementation.^{25, 26} Managing patient populations and measuring performance are not feasible without HIT tools, but most available EHRs provide underwhelming or no functionalities related to these needs.

A recent analysis detailed seven PCMH-HIT domains with critical unmet development needs: clinical decision support, team care, registries, personal health records (PHRs), care transitions, telehealth, and quality measurement.⁵ A brief review of some of these key domains and where readily available commercial EHR systems fail to meet their requirements is presented below.

Clinical decision support assists physicians with diagnosis, prevention and treatment via prediction rules, care reminders, and electronic prescribing. While the evidence base for decision support has grown robustly, many commercial EHRs do not incorporate sufficient tools, especially around chronic disease management and dose adjustment—an issue that is not well addressed by the government's MU criteria. Further, many providers fail to turn on decision support tools within their EHRs, or actually turn them off or ignore them because of reminder fatigue.

Registries are population management tools that enable the care team to stratify panels by chronic disease, behavioral health state, or preventive screening requirements in order to track patient use and needs over time. Registries are critical not only to providing a snapshot of unmet care needs, but also to enable a shift

toward proactive care of the entire patient panel, not just those who are seeking care. Initially conceived of as quality measurement tracking tools for common chronic diseases such as diabetes, their use is evolving to include tracking of behavioral health conditions. Yet many EHRs lack registry functions all together, forcing practices that need them to qualify for PCMH recognition to piece them together on Excel or other unconnected, work-around applications. Even existing EHR registries are often missing easy stratification, reminder notification, and options to build out new registries beyond a few limited chronic diseases. Further, they lack summary options to collate and report key data for the health team to act upon.

A Patient Portal or Gateway is an Internet-based patient tool for personal information access and care coordination, and digital patient-provider interaction.²⁷ Unlike a PHR, where the information is uploaded and maintained by the patient, a portal is managed by the physician office but is available to patients on-site or remotely for personal data access. It may or may not be integrated within the EHR. A recent survey suggests that patients want online tools to ease access to physicians, personal medical data, and payment.²⁸ Use of email “virtual visits” as part of a small-practice, 24-hour patient access program was associated with improved patient satisfaction, especially among younger, tech-savvy patients.²⁹ Patient portals have the potential to improve patient-access to their physician, utilize team care by allowing nonphysicians to respond to messages, and improve and automate data reporting. Contrary to current beliefs, early experience with patient portals in a large integrated system suggests that physicians do not get inundated with electronic communications; more than 70 percent of the communications get triaged to appropriate team members and actually reduce the overall volume of patient phone calls (David Bates, personal communication, 2011).

Team care technologies facilitate physician-led teams by enhancing real-time group communication, ideally through the EHR. Most available systems are absent functions like team messaging. This leads to utilization of non-EHR technologies such as email or paper records to document crucial intrateam communication, the backbone of PCMH processes. Few EHRs have tools to track team communication and document it outside of a basic note function.

New HIT applications need to be created or improved to capture novel PCMH team interactions, such as pre- and post-clinic team debriefings. These “huddles” ensure that all providers are synchronized in terms of their care goals for individual patients, and serve as a forum for discussing hospitalized patients and planning safe care transitions. Again, few applications have the functionality to record and search these team conversations, especially around care planning for transitions, yet these brief, accurately relayed, and time-sensitive communications need a secure place to reside to facilitate easy searching and tracking. There is a role here for tools to transmit information into the EHR beyond manually typing, such as voice recording or voice recognition software that syncs with the EHR.³⁰

Having discussed the HIT relevant to PCMH success, the remainder of the PCMH section focuses on issues of PCMH HIT development and use that have not been widely addressed in academic conversation. These include: how best to deploy HIT; care integration and transitions enabled by information exchange with specialists; upcoming technologies; how PCMH HIT could be affected by the “Digital Divide”; and the potential for PCMH and HIT to address health literacy and behavioral health in its patients.

Effectively Deploying HIT Within the Rubric of Practice Change

As described above, HIT is central to the core elements of PCMH. However, to be a truly effective tool, HIT must be seamlessly integrated into a practice's day-to-day functioning. This level of HIT integration can be difficult, especially when simply choosing and installing EHRs is complex and expensive, and interoperability is a huge challenge. For most providers, transitioning from a standard primary care practice to PCMH will require more than just ensuring that each of the key electronic functions are in place. Indeed, they will need to ensure that the adoption of the new technologies is partnered with changes in workflow and overall approach to patient care. These changes are challenging, and for certain groups of providers, such as practices with a small number of physicians, they will be particularly difficult to meet. Beyond the upfront and ongoing costs of EHR adoption, the lack of internal technological support adds complexity to making the necessary workflow changes for an effective PCMH.^{12, 31} For example, one study found that extensive care process alterations were necessary in order to achieve MU of electronic prescribing systems.²⁶

Regional Extension Centers (RECs), a creation of the HITECH Act, are funded, in part, by the federal government to help vulnerable providers with EHR selection, implementation, training, troubleshooting and support.³² The initial focus of the REC program is on enabling primary care providers (PCPs) to meet MU requirements within the first two years of the program. RECs additionally will provide essential technical support for HIT adoption and troubleshooting²⁶ and transformation cost assistance in areas with critical access and rural clinics.³³

As they are already assisting practices with EHR, it may be possible to expand RECs to serve as PCMH catalysts and disseminators among their other duties.¹² This builds on Grumbach and Mold's idea of a Primary Care Cooperative Extension Service, modeled after successful regional farming initiatives that share best practices and assistance through "practice learning communities."³⁴ In this capacity, RECs would offer a Practice Transformation Extension Service of team training, physician feedback, data collection and quality improvement, and care coordination and integration with public health officials and the community. Already, state Medicaid programs in North Carolina and Vermont have created regional community-based efforts around practice assistance in these areas, coupled with modest payment reform to encourage uptake. By assisting a region of primary care practices, Primary Care Cooperative RECs could also facilitate innovation sharing and relationship building through quality improvement collaborative functions, like those done by the Institute of Health Improvement, which have proved to be effective for a number of different provider organizations.³⁵ Expanding the functions of RECs to include PCMH transformation would likely help both organizations flourish in the changing health care landscape.

Unfortunately, we suspect that few RECs currently have the expertise needed to ably facilitate EHR adoption, much less to simultaneously help providers become PCMHs with minimal practice disruption. We suspect that the talent needed to help hundreds of thousands of physicians change the way they structure and deliver primary care is unlikely to be immediately available to most RECs. A longer-term business model for many RECs may be to focus now on helping facilitate EHR adoption and meeting MU, while actively evolving into practice

transformation catalysts for a time when the federal REC funding runs out. This transition will give RECs the time to develop the expertise to advise, assist, train and troubleshoot PCMH transformation. Their services will be essential to practices that often inaccurately predict the demands of EHR adoption in terms of: practice redesign; immediate and long-term costs; best practices; technical expertise; ease of installation; and time spent.^{12, 31, 36} While combining two major practice alterations—EHR installation and PCMH transformation may augment the challenges of change—it has huge potential to heighten the benefits, especially when the changes are so interrelated. Revamping practices consecutively increases disruption time and decreases efficiency, whereas concurrent renovations present a potentially quicker and more thorough solution.

HIT adoption can also be catalyzed by finding and developing practice champions.³⁷ Case studies show benefits to involving physicians early and through the whole process, from developing the EHR evaluation system to viewing demos, joining site visits, and making the final selection.³⁸ RECs, whether or not they later become catalysts of PCMH, will need to stir up similar engagement. Identifying internal HIT physician champions to spread enthusiasm and stand behind the HIT system through initial hurdles is a key facilitative role.²⁶ Augmenting the position of the practice champion as the mediator between the providers and the IT staff can ease the staff and economic costs of HIT adoption.³⁹

Finding Better Ways to Exchange Information With Specialists

While effective deployment of EHRs within practices and the accompanying workflow changes are challenging alone, an additional element is needed to ensure a successful transformation to PCMHs: the exchange of clinical data and care plans between primary care providers and specialists. Ensuring that these EHR systems are “interoperable” is a key goal of MU, especially for practices that are not part of integrated delivery networks with a common EHR platform. However, it remains unclear whether MU will require the kind of robust clinical data exchange needed to allow primary care providers to deliver truly integrated care. Even when PCPs and specialists use the same EHR platform, for example, automated electronic referrals and return of consultation results are not always seamless. Clearly, these challenges are compounded when providers use different EHR platforms. Coordinating referrals, and improving their value, not only is essential to the PCMH model, but is also a nascent early step in the formation of “medical neighborhoods.”

One early successful example of an improved referral system is the San Francisco General Hospital electronic referral system (eReferral), a Web-based application integrated within the EHR. Users enter the relevant information, which is sent in an automated, pre-populated form to the appropriate specialty clinician. A predetermined reviewer at the specialty clinic (a physician specialist for medical specialties or nurse practitioner for surgical specialties) reviews the referrals and decides within 72 hours whether to schedule the appointment, request more information, or further expedite the appointment. The reviewer can also suggest further evaluation or triage via the eReferral Web portal, which is captured within the EHR. On the visit day, the eReferral form is printed out with the information captured. The e-referral system was found to reduce inappropriate referrals by 50 percent, and avoidable follow-up visits were reduced as well. Further work by

this research group found that wait time for non-urgent visits declined in seven of eight clinics by up to 90 percent in the first six months of use, and expedited visits increased.⁴⁰ PCPs reported that specialists offered better pre-referral visit guidance and were more effective at addressing the referral question after implementation of eReferral.⁴¹

Of course, the success of such a system implies the presence of a common shared payment framework and willingness of both the specialists and primary providers to reduce referrals deemed to be of low value. In the current fee-for-service environment, getting specialists in particular to participate may prove to be challenging; however, in ACO shared-risk structures, there may be better-aligned incentives for this to occur. Furthermore, formal practice agreements between primary and specialty care can help facilitate information exchange and coordination of care in a timely fashion.⁴²

The Digital Divide and the Effectiveness of HIT in PCMH

While new and necessary information technologies are a promising part of the future of PCMH, they are unlikely to be adopted evenly and may lead to a widening gap between some providers and others, or between some patients and others. For example, increased dependence on electronic patient tools or patient-provider interaction may push some at-risk patients further into the “digital divide,” the gap in access between technology haves and have-nots. Patients who often have worse health indicators—the elderly, people in the lowest socioeconomic status (SES) brackets, and racial and ethnic minorities—are also most likely to lack easy access to a computer with Internet.²⁷

Using HIT in the medical home may exacerbate disparities if the patients at highest risk cannot access PHR or partake in online patient-doctor communication. One recent study posited that those who likely have the highest likelihood of receiving benefits from PHR are less likely to use it: Blacks and Hispanics compared to Whites, and the lowest SES quartile compared to the highest.²⁷ However, this study found that once patients adopted the PHR, their race/ethnicity was less associated with the likelihood that they would use these systems, and SES lost the association entirely. Similarly, patients with chronic disease are less likely to use the Internet than patients without chronic disease; however, when patients with chronic diseases use the Internet, they are more likely to do so for health-related reasons.⁴³ Consequently, patient portal installation without explanation and tutorials may worsen the gulf between vulnerable populations and others. However, it is possible that if providers and policy-makers pay attention and ensure good access, these high-risk populations may be effective at using these patient-oriented technologies.

HIT and Health Literacy in the PCMH

Unfortunately, closing the digital divide and improving access to HIT will not automatically create enhanced utilization or outcomes. Another basic structural barrier remains: limited health literacy, which influences understanding of medical materials and instructions. Low health literacy affects a person’s ability to perform informed decision-making.⁴⁴ Given that many patients

have difficulty understanding their medical conditions and instructions, simply affording them access to their PHR or EHR is insufficient alone to improve their outcomes. It is difficult to see how to make substantial gains in management of chronic diseases without addressing patients' health literacy needs. Fortunately, PCMH can use HIT to address this critical need through technologies targeting patients and providers.

Currently, health literacy gaps are not addressed by the structure of PHR. Indeed, a cluttered and scientifically worded record often hinders care. Medical homes need PHRs with capabilities for clear patient-PCP contact about prescriptions, questions and lab results. As such, the tool's layout must be optimized for this use, with explicit instructions, limited visual distractions, large font, simple syntax, and easily understood terminology.⁴⁵

As patient technology should be targeted at a low literacy demographic, provider tools must be redesigned for use by all levels of health care providers, including physicians, medical assistants, social workers, nutritionists, pharmacists, and behavioral health workers. The providers involved in practice redesign and PCMH transformation should be included in EHR redesign.

Medical homes are ideally equipped to use evidence-based techniques to screen for health literacy at the outset of care using pre-visit forms and standardized screening performed by medical assistants at all visits. Easy-to-use technology such as tablets can facilitate this screening and improve workflow. To be effective, identifying low literacy by screening must be coupled with steps to improve it.³⁷ The PCMH model's use of team care is well-suited to address health literacy in patients, as nonphysician practitioners can be efficiently trained and incorporated in the three-pronged "teach-back" method of evaluating patient understanding, re-explaining weak areas, and "closing the loop."³⁷ This form of health coaching reinforces both learning and patient activation, and starts to overcome inherent literacy barriers. PCMH practices are also similarly poised to employ emerging, supplementary resources (in print, audio or video, and increasingly Internet-based) that use unbiased ways of describing treatment risks and survival rates to improve patient choices about high-value treatments.⁴⁶ While these patient decision aids can be used independently by patients, they can also be administered to individuals or small groups by a practitioner on the PCMH care team.⁴⁶

HIT and PCMH Integration With Behavioral Health Care

Another critical area for PCMH success is behavioral health. Medical homes, through the use of interdisciplinary team care, are poised to significantly improve the link between behavioral health and primary care. Patients do not experience their depression and heart disease symptoms in isolation from each other, and treatment integration can synergistically address both. Moreover, Americans receive more of their mental health care from PCPs than from specialized mental health providers,⁴⁷ partly because many PCPs report an inability to get their patients adequate mental health services. Patients with depression, anxiety and substance abuse can receive proficient care in primary care environments, particularly those with the HIT-supported PCMH features of decision support and care management, as well as specialty consultation.^{48, 49} Ensuring that the primary care office delivers more effective mental health services—and that specialist care

is well-integrated with primary care—will be critical to the management of many chronically ill patients. Often the underlying reason for poor chronic disease outcomes is the presence of co-morbid and untreated mental health conditions. (Some argue that patients with severe and disabling addiction or mental health disorders would do best in a PCMH built not on primary care, but on behavioral health care—but that is beyond the scope of this report.^{49, 50} There are several different approaches that might be effective.

Some have suggested that co-locating behavioral health practitioners with PCPs can improve access, but the evidence on this intervention is mixed.⁴⁷ Traditionally, mental health providers have less HIT uptake compared to other specialists.^{49, 50} However, HIT, coupled with the PCMH environment, has great potential to improve patient access to, and care coordination with, behavioral health through telepsychiatry, digital educational and patient monitoring programs, Web-based mental health resources, as well as telephone-based diagnostics and emailing mentorships between psychiatrists and PCPs.⁵² This kind of improvement is essential, particularly in rural areas where patients often only have access to a primary care clinic. Telepsychiatry is a means of long-distance patient assessment and treatment, as well as psychiatrist-PCP consultation. PCMH could incorporate certain telepsychiatry features, such as scheduling and “rooming” the appointments; maintenance of one, combined medical record; and having the PCP as the point of care.⁵³ Where the cost of the technology required for telemedicine may be prohibitive, even simple email and telephone mentorship between psychiatrists and PCPs can allow for consultation and improved behavioral health outcomes.

Game-Changing Technologies on the Horizon

Some emerging HIT developments address PCMH needs in unique and promising ways, not simply by their novelty but because of their potential impact on provider workflow. “Smart” pillboxes not only organize a week of prescriptions based on medication schedule, but remind patients to take the pills. The user, care provider, or a family member can program the medication schedule online; audio, visual, phone and Web-based reminders can be selected for several notification categories ranging from missed medication to low battery alerts. These notifications can be accessed online by the caregiver, or can be sent to the physician immediately via cellular modem, removing the patient’s need for Internet.⁵⁴ Moreover, these systems can generate adherence reports for review by the care team.

Such technology can improve the quality and safety of care by improving adherence. In a medical environment where rates of non-adherence can reach 40 percent, and leads to avoidable hospitalizations costing more than \$100 billion,⁵⁵ helping patients follow often-neglected “Doctor’s Orders” is an important goal. Smart pillboxes would be particularly at home in PCMH because of the team care system, as alerts would allow for follow-up by the care team to address adherence gaps. Moreover, these systems encourage whole-person orientation, as the care team takes more active responsibility in what the patient does at home, taking a larger view of the complex field of adherence that incorporates not just reminder systems, but ideally multi-modal approaches to the behavioral, cognitive, and motivational areas needed to improve adherence.

A similar advancement is the “Health Buddy System,” a technology that better equips PCPs to provide behavioral health care by enabling remote behavioral health monitoring. A phone attachment prompts patients with daily questions (viewable by care practitioners through the Internet) and can offer medication reminders.^{52, 56} Daily text messaging reminder systems were found recently to double the confirmed smoking cessation rates in a large randomized trial in the United Kingdom.

Interactive voice response programs also show promise for promoting behavior change. One current system schedules and reminds patients about preventative health measures (such as cancer screens, immunizations, or diabetes control checks).⁵² Computer-generated messages recruit patients to make appointments, and later confirm and remind them of their schedule, helping providers save money and better utilize time. Analytics on each call help track quality measures, such as no-show rates.⁵⁷ An interactive voice response diagnostic for behavioral health has been on the market for almost 15 years, allowing phone-based preliminary diagnoses, and would be a welcome addition to the PCMH technology family.⁵⁸

What is clear is that in many ways, the medium and long-term success of the PCMH model rests upon its ability to identify and treat underlying mental and behavioral health co-morbidities, as well as to promote sustainable behavior change. HIT applications, both within and around, the EHR are poised to promote these important, and sometimes under-emphasized, initiatives.

Other Payment and Delivery Reform Efforts and Health IT

The Affordable Care Act calls for several other changes to the payment of health care, such as reduced payments for high re-admission rates and “bundling” of payments around episodes of care. These ideas, many of which are being implemented now by CMS, will pose the same challenges for providers as the ACO or the PCMH model. HIT systems will be critical to managing an episode of care that involved multiple providers and sites of care. Identifying high-risk patients and targeting interventions to reduce their re-admissions will require a similar set of EHR functionalities to those we describe above for ACOs (e.g., ability to exchange data, segment based on risk, robust decision support, registries, etc.). The success or failure of these efforts will rely heavily on the ability of HIT systems to enable changes in practices to improve care coordination, improve quality, and reduce costs.

Unintended Consequences

It is important to acknowledge that EHR adoption also has the potential for unintended consequences, as described by the RAND Corporation for the Agency for Healthcare Research and Quality.¹³ Such consequences can include: poor integration with paper-based records; more work for physicians (particularly during the adjustment to EHR); constant demand for system alterations; creation of new types of errors (entering data in an incorrect area); or undesirable alterations to communication patterns and practices (the ‘illusion of communication’ resulting in uncommunicated information). This issue has gained prominence with the release of the November 2011 Institute of Medicine report *Health IT and Patient Safety: Building Safer Systems for Better Care*. This report recommends a number of steps, including increased federal efforts to monitor and prevent the adverse consequences related to HIT implementation.

However, potential negative repercussions do not devalue the importance of HIT in terms of ACOs or PCMH. We believe that the potential benefits of HIT likely outweigh potential unintended consequences. Indeed, such unforeseen outcomes are a risk of any system change, and can be minimized by preparation and thoughtfulness, and ready assessments of new technology and practitioner response to it.

Conclusions

Though questions remain around the impact and scope of early HIT adoption, it is our firm view that HIT adoption is critical to fixing the dual pillars of our health care system crisis—poor outcomes and high costs. HIT is inadequate alone as a systemic fix, and thus will need to be incorporated into broader changes in how we deliver care. Importantly, both ACOs and PCMHs are still in their infancy, and at this point, it is unclear how they will evolve and vary across the country. However, an optimistic outlook regarding their potential suggests that opportunities exist to leverage PCMH and ACO delivery redesign with HIT adoption in order to integrate efforts toward safer, more effective, less costly care. But doing so will be a large challenge because of the inadequacy of current EHR systems, provider practice constraints, and misaligned payment models. Current efforts around MU are a helpful start but inadequate for getting the kinds of functionalities we will need to effectively manage population health (which is at the heart of these delivery system reform efforts). While most policy-makers, vendors, and HIT experts are very focused on MU—which is understandable—we need to start paying attention to the needs of PCMH/ACO implementation now in order to help these delivery reforms meet their promise. Federal policy-makers need to closely coordinate these efforts (meaningful use and PCMH/ACO demonstration efforts) to ensure that CMS, as the largest payer in the country, is sending clear signals about the kinds of delivery changes it wants to promote. At the same time, providers and vendors must begin to grapple with the novel challenges that implementation offers in areas such as team-based communication, behavioral health, health literacy, and HIE across unlinked providers to realize the full potential of these reform efforts.

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Acronyms

With acronym listed first

- ACA or PPACA (Patient Protection and Affordable Care Act of 2010)
- ACO (accountable care organization)
- AHA (American Hospital Association)
- AHRQ (Agency for Healthcare Research and Quality)
- ARRA (American Recovery and Reinvestment Act of 2009)

- CAH (critical access hospital)
- CAP (Cooperative Agreement Program)
- CCD (continuity of care document)
- CDA (clinical document architecture)
- CDS (clinical decision support)
- CMS (Centers for Medicare & Medicaid Services)
- C-PNRP (Chicago Patient Navigation Research Program)
- CPOE (computerized physician order entry)

- ED (emergency department)
- eHI (eHealth Initiative)
- EHR (electronic health record)
- EMR (electronic medical record)
- EP (eligible provider)

- HHS (U.S. Department of Health and Human Services)
- HIE (health information exchange)
- HIO (health information organization)
- HIMSS (Healthcare Information and Management Systems Society)
- HISP (health information service provider)
- HISPC (Health Information Security and Privacy Collaboration)
- HIT (health information technology)
- HITECH (Health Information Technology for Economic and Clinical Health Act)
- HL7 (Health Level Seven)

- IDN (integrated delivery network)

- MSA (metropolitan statistical area)
- MU (meaningful use)

- NAMCS (National Ambulatory Medical Care Survey)
- NCHS (National Center for Health Statistics)
- NHIN (Nationwide Health Information Network)

- ONC (Office of the National Coordinator for Health Information Technology)

- PCMH (patient-centered medical home)
- PCP (primary care physician)
- PHR (personal health record)
- POS (place of service)
- PPACA or ACA (Patient Protection and Affordable Care Act of 2010)

- REC (Regional Extension Center)
- RHIO (regional health information organization)
- RWJF (Robert Wood Johnson Foundation)

- SDE (state designated entity)
- SES (socioeconomic status)

- UIMC (The University of Illinois Medical Center)

- VA (U.S. Department of Veterans Affairs)

With expanded wording listed first

- accountable care organization (ACO)
- Agency for Healthcare Research and Quality (AHRQ)
- American Health Information Management Association (AHIMA)
- American Hospital Association (AHA)
- American Recovery and Reinvestment Act of 2009 (ARRA)

- Centers for Medicare & Medicaid Services (CMS)
- Chicago Patient Navigation Research Program (C-PNRP)
- clinical decision support (CDS)
- clinical document architecture (CDA)
- computerized physician order entry (CPOE)
- continuity of care document (CCD)
- Cooperative Agreement Program (CAP)
- critical access hospital (CAH)

- eHealth Initiative (eHI)
- electronic health record (EHR)

- electronic medical record (EMR)
- eligible provider (EP)
- emergency department (ED)

- health information exchange (HIE)
- health information organization (HIO)
- Health Information Security and Privacy Collaboration (HISPC)
- health information service provider (HISP)
- health information technology (HIT)
- Health Information Technology for Economic and Clinical Health Act (HITECH)
- Health Level Seven (HL7)
- Healthcare Information and Management Systems Society (HIMSS)

- integrated delivery network (IDN)

- metropolitan statistical area (MSA)
- meaningful use (MU)

- National Ambulatory Medical Care Survey (NAMCS)
- National Center for Health Statistics (NCHS)
- Nationwide Health Information Network (NHIN)

- Office of the National Coordinator for Health Information Technology (ONC)

- patient-centered medical home (PCMH)
- Patient Protection and Affordable Care Act of 2010 (PPACA) or (ACA)
- personal health record (PHR)
- place of service (POS)
- primary care provider (PCP)

- Regional Extension Center (REC)
- regional health information organization (RHIO)
- Robert Wood Johnson Foundation (RWJF)

- socioeconomic status (SES)
- state designated entity (SDE)

- The University of Illinois Medical Center (UIMC)
- U.S. Department of Health and Human Services (HHS)
- U.S. Department of Veterans Affairs (VA)

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